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Oscar J Mayer

THE

ART AND SCIENCE

OF

SURGERY.

BY

A. J. HOWE, A. M., M. D.

PROFESSOR OF SURGERY IN THE ECLECTIC MEDICAL INSTITUTE; AUTHOR
OF A TREATISE ON FRACTURES AND DISLOCATIONS,
MANUAL OF EYE SURGERY, ETC.

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PREFACE.

In an age less given to book making than the present, it was common for medical authors to furnish an excuse for offering their productions to the profession; but as such apologies were penned after the books were written, they were necessarily devoid of sentiment; and the custom has, by common consent, become "more honored in the breach than the observance."

The position I have held for the last twenty years as a teacher of anatomy and surgery has placed me under obligations to numerous friends who have frequently requested me to prepare a work on the principles and practice of surgery; and having been induced to engage in the labor, I found it more and more captivating as progress in the undertaking was made. When my manuscript and illustrations were nearly completed, a fire swept away the toil of years; but not discouraged by the seemingly untoward event, I undertook at once to reproduce what had been lost; and I have obtained so much additional experience, and have acquired so many maturer views upon important chirurgical topics, that my readers may have been the gainers. I begin to congratulate myself upon what I once considered a misfortune.

When my *Treatise on Fractures and Dislocations* was published, the design was that in time it should become a part of a general work on surgery; and such continued to be the understanding when the *Manual of Eye Surgery* made its appearance; but the work as a whole embraces fifteen hundred pages, therefore the three parts would make a book inconveniently large. To carry

7493

PREFACE.

[illegible] my aim to bring this volume into [illegible] of the material would allow, or [illegible] proper exhibition of the subjects

[illegible] a surgical character might legitimately [illegible] this work, but as most of them are [illegible] general therapeutics, it was thought [illegible] debatable ground, even though the line [illegible] surgery be not clearly defined.

[illegible] to make this work, in connection [illegible] mentioned, a text book for students, [illegible] physicians engaged in the general [illegible] therefore I have dealt largely in es[illegible] space with what might be regarded [illegible] incidental. To gather up the soundest views [illegible] surgery, to condense them as far as practicable, [illegible] ideas in the combination, has been a labor [illegible] magnitude. Some readers may decide that cer[illegible] too much space, and that too little attention [illegible] elucidation of what seems to them of vast [illegible] hope the dissatisfied will endeavor to be as char[illegible] defects as the gravity of the faults will admit, [illegible] examine the book will be generous as well as [illegible] was not entered upon without misgivings and [illegible] consideration of the responsibilities assumed.

[illegible] eminently a progressive branch of medical science. [illegible] improvement follows another in rapid succession; [illegible] to execute operations of a startling character [illegible] yet the good surgeon is always conservative in the [illegible] of such diseases as come under his charge; and he [illegible] frowning upon questionable procedures undertaken [illegible] popular applause. He who indulges in such experiments, [illegible] takes delight in mutilation, never attains an en[illegible] reputation in the profession.

The therapeutics set forth in this volume are not founded upon any prevailing dogma or preconceived theory, but are chiefly dictated by results attained through a rational empiricism. Until quite a recent date it has been customary to treat an inflamed joint, organ, or part of the body, with cold applications; but at present the vigor and impressibility of the patient are considered before it is decided whether a heating or chilling appliance is to be used. If the shock produced by the application of cold water be likely to result in prolonged vital depression, and a high temperature, whether moist or dry, be more agreeable to the feelings of the patient, the latter is generally to be adopted. In other words, little attention should be paid to time honored customs in the administration of remedies.

Prominent surgical writers of the past have advocated that morbid phenomena should be treated in accordance with established rules, or "general principles;" and have persistently ignored the idea that much headway can be made in the use of "specifics," yet these very authors, when discussing the therapeutics of venereal diseases, become zealous advocates of specific remedies,—they declare that syphilis can only be cured with mercury, and gonorrhœa with copaiba.

Instead of following old doctrines I have in a majority of instances been able to name a single remedy that will exert a specific action upon the morbid state, or a combination of remedies that will make a favorable impression, directly or indirectly, upon the disease under consideration. Inasmuch as the organism soon becomes accustomed to the action of a remedy, and thereby not so decidedly impressed, the practice of changing medicines often, or of administering them on alternate days, is attended with satisfactory results. As a general rule, no remedy should be prescribed in quantities that depress the vital powers. It may sometimes be necessary to give opium in doses large enough to be depressing, in order to allay a degree of pain that in itself is still more devitalizing. A desirable effect is occasionally obtained by the use of the iodides in somewhat injuriously large doses.

Hypertrophies, lymphatic enlargements, and periosteal irritations, cannot be favorably impressed without these remedies are employed in poisonous quantities. The ill effects of the medicine are not lasting; and the disease, if not arrested or overcome, might prove dangerous to life. Valuable remedies, like blessings, are not always unmixed with evil. The cases are rare in which a lowering course of treatment is desirable. A man of full habit, who suddenly receives a prostrating injury, such as the crushing of a limb, will get along better if subjected to the action of a cathartic, and restricted to a slop diet for a few days. The temporary depletion brings a plethoric state of the body into accord with a comparatively inactive condition necessitated by the nature of the accident.

In what is ordinarily denominated operative surgery it is rarely possible to prevent the loss of some blood; and if considerable hemorrhage occur the waste does not prove detrimental in most instances. A man who, on account of a lacerated limb, loses eight ounces of blood before amputation is performed, commonly recovers as rapidly as he who undergoes a similar operation and sustains no hemorrhagic loss. A patient of mine who parted with an alarming quantity of blood while undergoing lithotomy, made a quicker recovery than is averaged by those who lose less while passing through similar operations. This is not stated as an argument in favor of blood-letting, but to show that great hemorrhages are not necessarily dangerous to life, and that a temporary loss of blood may not retard the recuperative processes.

Reparative power, and ability to eliminate animal poisons, are qualities desired in a surgical patient. If the chemical combinations existing when the maximum of life is present be greatly disturbed by devitalizing ferments, by disorganizing processes, or by decompositions inseparable from states peculiar to old age, medicines do little towards averting a fatal issue. The value of a remedy depends upon its ability to *assist the vital energies* in establishing and maintaining a state of health; occasionally the importance of a remedy depends upon its power to destroy the cause of disordered action.

In the preparation of this work I have avoided partisan views, and striven to be as positive in expressing myself as is becoming in a surgical author. The productions of the most reputable writers and teachers have been consulted, and occasionally drawn upon; but in the main I have given expression to ideas based upon knowledge gained by personal experience. I have aimed to be decided without manifesting an offensively dogmatic spirit.

The illustrations are not especially numerous, nor are all of them executed in the highest style of art; yet as far as they go they serve the purpose for which they were designed; and in no instance is an old cut introduced to occupy space or to swell the number employed in the work. The pictures are mostly from my own sketches. A few are modified from drawings found in other works, or are selected from the best sources.

In conclusion, I would thank my professional friends for past favors and good opinions, and say, that this is the last time any book of mine may claim their indulgence, unless thrift and prosperity call for amended editions.

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PRACTICE OF SURGERY.

SECTION I.

PHYSIOLOGICAL CONSIDERATIONS.

THE science of surgery is not rigidly exact, as is that of mathematics, for it has to deal with organic materials and vital forces which are subject to variation; but it embraces so much positive knowledge, and brings within its scope so many established facts and principles, that it constitutes an important department of medical science, and in significance ranks above some of the physical sciences. Though organic nature in her varied changes aims at precision, and in her evolutions is commonly reliable, she occasionally takes leaps, and frequently gives birth to monstrosities. Excess and deficiency of development are not uncommon. Pigmies and giants have a place in nature; and a supernumerary digit is not the rarest thing in the world. In no branch of natural science are we to look for perfection.

Surgery having its foundation in physiology, has to deal largely in vital manifestations. A wound heals by the agency of the same forces that are instanced in the growth of animal structures. Though pathological phases present themselves in the work of reparation, they are not educed by a distinct and independent action, but by a swerving of what otherwise would eventuate in a normal career.

The endless mutations occurring in the development of a creature and in the repair of an injury, depend upon the influences of vitality, which is a property of living organic matter. Vitality enters an organism at the commencement of its being, and enables the individual to undergo the infinite changes necessary to existence, and to continuance by reproduction. Finally, when this property is withdrawn from the creature, the preservative combination is at an end, and decomposition of the dead structure results.

It has always been an interesting subject of inquiry, whence comes this mysterious property we call vitality? Physicists have expended a great deal of learning upon the problem, yet it is likely to continue unsolved. We can have no conception of vitality as distinct from organic matter, therefore it has been presumed that a peculiar combination of elementary substances, and physical influences exerted when the materials unite in definite proportions, may necessitate the presence of the vital property. But all this is purely speculative, there being no substantial evidence that such be the origin of the vital principle or property.

The earliest form of organic matter endowed with vital properties, is that of a cell, though in an unorganized state, a nitrogenous slime, bearing the name of protoplasm, has been discussed as the physical basis of life, and as possessing incipient vital properties. It is claimed that the cell springs from this albuminous jelly, and takes vitality from it. The proof offered that the protoplasmic matter possesses vitality is in the fact that movements are observed in the colloid mass; but motion is also observed in certain inorganic solutions, therefore the evidence is not convincing.

A substance analogous to protoplasm is exuded in the form of plastic lymph upon the surface of a healing ulcer. This is substantially the serum of the blood, and retains the vitality of the fluid from which it springs. Cells forming from this plastic material would necessarily be endowed with vital properties; but primitive protoplasm must obtain the vital principle in some fortuitous way.

It is reasonably asserted that organic matter once devitalized can never be revived. In what is called cell-grafting dry epidermic scales are placed upon a raw or denuded surface, where they are expected to absorb moisture and renew their vitality. If they accomplish what is designed of them, *i. e.*, form attachments and enter upon the work of reproducing themselves, the logical inference is that they were never wholly dead, but like a dried seed, retained vitality in a latent state, and only awaited warmth and moisture to awaken their dormant energies. If a chemist could determine by analysis whether dessicated epithelial scales contained vitality, the question might be decided, but his processes necessarily destroy the vital principle.

Attempts have been made to show that protoplasmic matter may, under favorable conditions, be transformed into living organisms; in other words, that new and original beings may, without other parentage, be ushered into existence, having merely protoplasm for their physical basis, and "favorable influences" for their vital endowment. Now, if an organism could be produced in any such way, it is not difficult to devise plans for its transformation into higher and more complex beings. And if such were the case, the world may have been thus peopled with all varieties of vegetable and animal life; and there would be no necessity for special creations. But no such scheme has been proven. All creatures, so far as known, except original stock, have sprung from pre-existing living beings; and no such thing is demonstrable as spontaneous generation.

A cell, though a very simple organic form, has a thin wall or envelope which encloses fluid and granular matter. The vital property connected with the capsule and contents carries on quite a variety of functions in this tiny laboratory. The cell can reproduce itself by division; and by a combination of cells tissue may be formed. Of course, there can not be growth, multiplication and development, without an abundance of pabulum in a liquid or gaseous form. A part of the pabulum may be inorganic material if in a state of solution, but a certain proportion of the nutriment must be matter which has lived before. No organism can subsist entirely upon supplies obtained directly from the inorganic world.

The history of organization shows that living beings, while vitality is active and nutrition rapid, continue to grow and to increase in weight; that having arrived at mature age they remain for a certain period in a state of equipoise, during which the process of waste equals that of repair; and that, finally, through a decline of functional energy, the losses exceed those of accumulation, less of life is present, and death results. Vitality, then, is a property which grows old, and would be entirely extinguished were it not for its continuance through the office of reproduction. United again with nascent organic matter it renews its youth, and attains its maximum potency while the physical basis with which it is connected, is in its highest condition of vigor. As has been previously stated, we have no idea of vitality as separate from organic matter, therefore we might speak of it as young, mature and aged, as we can of the living materials with which it is inseparably connected. With the death of an organism the vital principle is extinguished; but by the reproduction of the organism vitality is conserved and perpetuated.

In the lower organisms the functions of the creature are simple, consequently there is not much variety in the work performed; but in the higher animals there are certain cells for elaborating bone, and others for producing cartilage, and still others for constructing muscle, nerve, vessel, gland, membrane and the many varieties of tissue. The source of supplies for the growth and repair of all these structures is in the serum of the blood. And before this nutrient material can get at the cells which are to assimilate it or prepare it for specific purposes, it has to pass through the thin coats of the capillary vessels. Ordinarily the blood is highly charged with nutriment, yet the vessels themselves can not transform this into fat and brain, and lung tissue, but the cells of those structures execute that office.

The arterial twig going to a growing tumor carries thither nutritious supplies, but it does not surrender ready made tumor material; the morbid cells within and around the tumor imbibe ordinary nutriment, and then transform it into the preternatural growth. The extirpation of a benign tumor terminates the morbid action, for the cells which elaborate tumor material are destroyed. A cancer is not surrounded by a capsule or limitary membrane, but is infiltrated in the tissues and embedded in the inequalities of the structures where it is developing, therefore some of its cells are likely to escape the operator's knife. Besides, cancer cells get into the lymphatic vessels and remain undisturbed by any efforts at excision or removal by escharotics. These vagrant cells may remain in a latent state for years, and then from some exciting cause be provoked into active reproduction. There is reason to believe that a nodule forms at the spot where the vagrant cells are located. Their presence seems to beget induration. It is probable that the vagrant germs are in a rudimentary state; and that months or years may be required to bring them to a condition of maturity.

PATHOLOGICAL CONSIDERATIONS.

In health all the operations of the body are duly and properly performed; and the conditions upon which life depends are favorable. An individual who is not sick may not always enjoy the same degree of health, for the conditions referred to are not uniform in their action. Comfort is essential to prolonged periods of average health, therefore an unimpaired state of physical well-being can only be maintained while the individual is supplied with wholesome food, suitable clothing, fresh air, and what are deemed the necessaries of life. Health is incompatible with a protracted state of discomfort.

Disease is not an entity like a mote in the eye or a parasite on the skin, but a modification of the organic functions, or a condition which disturbs the usually harmonious movements of the organic machinery. A child sick with scarlatina does not, during the progress of the disease, lose any of its bodily functions—it breathes and eats and sleeps—though with every vital operation perverted. A subtle poison introduced into the victim, has by depressing one function and exalting another, unsettled the natural or normal processes peculiar to health.

Fortunately there is a conservative tendency in the animal economy which in the majority of instances leads to recovery when a morbid state exists. Provision is made for the elimination of poisons which constitute the foundation of many diseases or morbid conditions. This preservative influence, which is one of the attributes of vitality, often cures the patient even when a wrong diagnosis has logically led to faulty therapeutics.

Pathology treats of disease; and the surgeon has much to do with morbid or pathological conditions. But to understand disease there must first be a knowledge of healthy action. The student who would be a pathologist must begin his career by studying physiology. And the physician who would medicate successfully, should bear in mind the conservative force alluded to, and aim to aid nature in the reparative procedure. At worst, the medication should not be potent enough, though erroneously applied, to endanger life. A safe maxim for the medical man is, to do no harm even if he can do no good.

Whenever a disturbing element is introduced into the human organism, which by its deranging influence develops a set of phenomena or symptoms denominated "disease," it is presumed that the nervous system is primarily impressed; and that the circulatory and glandular systems are secondarily perturbed through the nerves connecting remote parts with the nerve centres. But, as a nervous impression is carried with lightning rapidity, the vitiating influence reaches distant parts of the organism instantaneously.

Not unfrequently a virus which is to operate in the development of serious morbid phenomena, requires days or even weeks after it is received into the body, before it acquires maturity, or a potency capable of making a full and specific impression. During the period of incubation something like a germinating process is thought to take place in the original poisonous element. The virus of vaccine disease remains in the body several days without creating local or constitutional disturbance. At length, after passing through some mysterious evolutions, the poison develops all the phenomena of vaccina.

The causes of morbid action are infinite, and can not therefore be enumerated; a few may be recounted by way of elucidation. The bite of a serpent or rabid animal may exert disturbing influences in two ways: First, by the local injury inflicted; and, secondly, by the poison introduced into the circulation, a constitutional impression being made.

The atmosphere in certain localities is charged with miasms which enter the body through the medium of the lungs, and excite febrile action. The chilling influence of a draught of air upon a person relaxed in sleep, excites rheumatic pains and respiratory difficulties. However, it is not to be understood that cold, dampness and miasm, will beget a morbid action in every person, for some individuals possess greater resisting powers than others; and the same persons resist the invasion of disease in a less degree at one time than at another.

The effluvia arising from crowds of human beings when ventilation is cut off, enter the lungs as a miasm and engender disease.

A severe burn imparts a dangerous shock to the nervous system, and the secondary effects, from subsequent suppuration, establish morbid conditions. Bruises, fractures and other grave injuries, produce, in addition to the primary shock, a set of systemic derangements. As has been stated, there is no end to the causes of morbid action.

Disease may ordinarily be divided into three stages: First, the invading, which embraces the period of increase; second, the middle, during which the height of the morbid action having been attained, signs of reaction begin to manifest themselves; third, the period of decline, when the morbid phenomena are less pronounced than in either of the preceding stages. This division presumes, of course, that the morbid career terminates in recovery, as most diseases do. The last stage embraces the period of convalescence, and the ultimate issue is re-established health. But in some morbid states, especially in those which are organic in their nature and malignant in character, there is a regular progression or advance from the beginning to the end, and the termination is death.

Attempts have been made to draw sharp lines of distinction between medical and surgical diseases, but such efforts can not be strictly carried out. It is difficult to distinguish between the febrile symptoms produced by the inception of animal exhalations which arise from crowded and unventilated apartments, and those induced by the absorption of putrid fluids from a wound; or to make rational discriminations in the treatment of the two varieties of blood poisoning. The initiative chill, the cardiac excitement, the perverted secretions and the cerebral disturbance, indicate similar morbid conditions in both kinds of poisoning, and each calls for identical therapeutic measures. To be sure, surgical diseases, etymologically considered, are those in which the hands are used in the management of them, or some kind of manipulation is applied, as in the use of instruments. Such diseases are mostly of the extremities and of the external parts of the body. Medical diseases are more especially confined to the viscera, and are therefore obscure in their nature, and more amenable to medicine than to manipulation. However, the peritonitis which follows parturition is practically like that which attends strangulated hernia; and the pneumonia succeeding exposure to a cold current of air is not substantially unlike that which is the sequel of a bullet in the lung.

It has been convenient to assign a certain class of diseases to the province of the physician, and a certain other class to that of the surgeon, but the latter can legitimately lay claim to those only which require manipulation in their management. However, he is not rigidly restricted to these; he medicates as well as manipulates. Besides, every experienced physician practises more or less of surgery; he applies poultices, plasters and liniments; and in isolated locations he is compelled to treat fractures and to perform important surgical operations. Under such circumstances he executes a mixed practice, and claims to be physician and surgeon. On the other hand, very few professional men in this country practise surgery exclusively. This is as it should be, for many surgical diseases require as high a degree of skill in the medication of them as is possessed by the physician who lays no claims to surgical experience.

SURGICAL DIAGNOSIS.

The principles of surgery have become so well established and clearly defined, that the zealous learner, who is thoroughly trained in anatomical and physiological knowledge, may, by a careful perusal of surgical literature, confidently take the first steps in the study of surgical science, and prepare himself to make rapid progress in gaining correct ideas of the practice of the art as soon as clinical experience can be enjoyed.

Without a thorough understanding of the principles of a science no man need expect to become master of it. Boldness and tact may enable an individual, whose mental force is surgically inclined, to execute some notable operations; but nobody can attain distinction in the higher planes of surgery without becoming intimately acquainted with the principles on which the foundation of the science is based. A practitioner possessing slender acquirements in the rudiments of a medical education, may be politic enough to display considerable cleverness in the management of surgical diseases restricted to a certain range; yet the greater portion of surgical practice, especially its difficult grades, will naturally and inevitably find its way to those who have earned a reputation by prolonged courses of study, critical observation, and a determination to succeed in the higher walks of the profession of their choice. A physician who has no desire to compete with the skillful performer of surgical operations, may be quite well acquainted with the science of surgery, and appreciate the principles upon which its brilliant results are attained; he is not necessarily inferior in education and mental strength because he does not display daring and dexterity in the handling of a knife, or adroitness in the manipulation of a dislocated limb, but to take as high a rank in the profession as the accomplished surgeon, he must be thoroughly acquainted with the therapeutic value of remedies, and understand the science of diagnosis, for in this all theoretical opinions in medicine converge, and from it all practical rules proceed. The effective appreciation of remedial means must depend upon a correct diagnosis—understanding—of the morbid action which may be the aim of the physician to subdue. The chemist or pharmacist may possess a critical knowledge of the physical character of medicinal agents, yet have no deep appreciation of their remedial qualities. The experienced and accomplished physician recognizes at a glance, or concludes after carefully grouping and comparing the symptoms of a diseased or morbid state, what particular beneficial effect can be produced with a medicine, and how much will be required to accomplish the desired purpose. He quickly sees what is to be done, and knows what will do it, having no thought or regard for "medical formularies." The great defect among physicians at large is, that they rarely comprehend morbid phases as manifested through symptoms, consequently the right remedy is seldom administered. It must forever remain undisputed that if the phenomena of a disease be wrongly interpreted, the treatment, as a natural sequence, must be correspondingly faulty. The medical man who makes a jumble of a set of pathological signs, is likely to devise a complex mixture as a remedy. When a problem in diagnosis is rightly solved, the therapeutic indication is simple and precise.

The surgeon who has attained eminence without accident or caprice, must have been a close observer and ready interpreter of diagnostic signs. It is plain to everybody that it does not necessarily require a high order of skill to excise a mammary gland or to amputate a limb, but it may require the highest order of professional attainments to know when the operation is necessary. It is generally easy to reduce a luxated bone, yet who is possessed of sufficient acumen and experience to diagnose the lesion under all circumstances? It is not becoming in a young surgeon to boast that he can, as if by intuition, see a surgical disorder at a glance, for no such powers have been granted to any man. The time will come when the believer in intuitive knowledge will commit a blunder that a less confident and more discreet operator would have avoided. The more experienced a surgeon becomes, the closer he scrutinizes every sign that bears upon diagnosis or an understanding of every feature of the disease under contemplation. If a tumor of the scrotum come under observation, and the diagnostic signs be not clear as to the nature of the disease, the use of the exploring needle is not to be despised, though it be quite evident that a hydrocele exists. It is not a pleasant surprise to cut into an aneurismal swelling under the impression that an enlarged lymphatic gland needs removing. Strangulated hernia has destroyed many valuable lives that might have been saved if the disease had been diagnosed correctly from the start.

Surgical diagnosis depends largely upon physical changes in the part diseased, hence a knowledge of anatomy is an essential feature of a surgical education. Not that a diseased structure closely resembles a normal state of the parts as a necessity, yet the natural tissue must be understood before an altered state of it can be fully comprehended.

The discreet and experienced surgeon inquires into the history of the disease under consideration; he notes with care every feature and phase at variance with health, comparing, when practicable, one side of the body with the other; and he carefully estimates the importance of every symptom presented. Mensuration and exploration with the most approved instrument for such purposes, are to be executed with scrupulous regard for exactitude in cases where they can be rendered available in establishing a diagnosis. A practical eye may readily detect a variation in the size of two corresponding parts in the body, or in the length of two limbs, but it is often a safe plan to apply a tape-measure, in order that the difference may be noted in inches and parts of an inch. The course of a bullet or fistulous track can not generally be known until a probe has been carefully employed. The presence of a vesical calculus is detected by an instrument carried through the urethra into the bladder; and the size and character of a uterine tumor are mostly determined by the use of an exploring instrument which is made to pass through the cervix uteri.

The influence of sex, especially in diagnosing diseases of women, must not be neglected, nor over-estimated. Excitability of function, coupled with a high degree of nervous impressibility, has much to do with what are denominated "hysterical" states. The period of life embraced between fifteen and forty-five covers the time during which the uterus and its appendages exercise peculiar influences upon the rest of the organism; and even then, only at intervals. Many women are not so morbidly impressible, so far as sex exerts an influence, as some men; a man may exhibit many of the phases of hysteria, and be benefited by the action of assafœtida.

Occupation, social condition, and habits, are to be considered while forming a diagnosis of certain morbid states: A worker in phosphorus is liable to disease of the jaw; a miner to bursal tumors on the elbows; a floor-scrubber to housemaid's knee; a spinster is subject to cancer and ovarian cysts; and a bachelor to sexual disorders of various kinds; and those who drink beer to excess are apt to have enlargement or induration of the liver. The use of wine and stimulating food, especially at late and irregular hours, leads to gout and nephritic diseases.

It would be unreasonable to ascribe every morbid phenomenon in a syphilitic patient to the influence of the venereal taint; or to declare that every ill manifested in a scrofulous person is attributable to the influence of struma, but those diseases exert so wide and lasting an impression that when they are known to exist, it is safe to give them a prominent consideration. Eczematous diseases possess the power to exhibit themselves in many different phases—for instance, an individual having an eruptive form of eczema upon the body, may, if the eruption be suppressed, suffer from a paroxysm of asthma while the skin remains smooth; and as soon as the respiration is relieved by the influence of medication, the eruption will appear again, or some phase of disease will manifest itself in another part of the organism. In fact, eczematous eruptions should not be attacked with topical agencies, lest a morbid action be driven to some internal organ; yet there is little danger from external applications, if what are known to be constitutional remedies be administered at the same time.

Hereditary tendencies or peculiarities are so persistent in some families that if an inherent morbid quality be known, much may be judged in regard to a case that otherwise might be overlooked. Among the diseases that descend from one generation to another, are scrofula, phthisis, cancer, syphilis, varicose states of the veins, anal disorders, kidney difficulties, and mental aberrations; it is not improbable that many other affections of a serious nature are kept along by inheritance. Syphilis oftenest leads to complications of a perplexing character—a chaste woman, for instance, who has borne children to a syphilitic husband, is in a condition to bear syphilitic children to a second husband who is uncontaminated; and a healthy wet-nurse may become infected through a nursling, and transfer the disease to her own family, though she and her husband have lived blameless lives.

Persons presenting themselves for surgical treatment are apt to allege that the cause of the disease could be directly ascribed to a blow, strain, or trivial injury of some kind, though in a majority of instances it is probable that the supposed cause is not the real one. A woman who has cancer of the breast may ascribe the origin of the disease to a milk abscess that affected the mammary gland some years previous to the appearance of the malignant disease. In this she may be correct, yet it is not improbable that the location of the malignant manifestation was merely a casual coincidence. The death of Sir Benjamin Brodie was caused by malignant disease of the shoulder-joint, and the cancerous invasion was in an articulation that had suffered from dislocation some years before; but if it be considered how frequently dislocation of the shoulder occurs, and how rarely cancer attacks that joint, it would be a stretch of the imagination to behold any connection between the injury and the subsequent cancerous occupancy.

Patients, to conceal illegal and disreputable acts, frequently exhibit considerable ingenuity in framing plausible theories to account for morbid phenomena, therefore the surgeon must be on guard against being deceived by fraudulent representations. A woman may, through occult motives, claim that her person has been violated, and exhibit abrasions of the vulva and contusions of the wrists and throat, as if a struggle had occurred, yet the whole be self-inflicted. Infantile leucorrhœa has been represented as evidence that a man having gonorrhœa has had criminal contact with the child; and false imprisonment has resulted.

Melingerers not unfrequently feign diseases with such tact that no expert in the arts of the detective can discover the trick. The object of melingering is generally to receive the advantages of eleemosynary institutions, or to escape work or military duty.

The questioning of a patient, while the surgeon is attempting to establish a correct diagnosis, is to be carried on adroitly, especially if there be a preconceived notion on the part of the patient that his disease is thus or so. A skillful questioner will so frame his queries that the patient can not discover which way the querist would like or expect to have them answered. A shrewd examiner does not put leading questions, unless it be to make the patient's testimony contradict itself before the evidence is complete.

Several of the senses are levied upon in making out a difficult diagnosis; the sight notices alterations in form, color, volume, and transparency, and this sense can sometimes be aided by a microscope or magnifying instrument; the sense of touch may discover changes in shape, consistence and mobility; the ear detects abnormal sounds of the heart and respiratory organs, as well as the bruit of aneurisms, and crepitation; unpleasant and suspicious odors, as of the breath, perspiration and foul discharges, are detected by the sense of smell. The sense of taste once disgustingly employed in forming a diagnosis, is no longer degraded for any such purpose.

A pocket lens is a cheap and useful instrument to be employed in observing minute objects, as cutaneous eruptions, parasites, granulations and certain discharges. The microscope is an instrument of value to the pathologist in critically examining liquids and solids morbidly produced. The instrument has, unfortunately, been decried by those who know little of its use; and, perhaps, overpraised by those who know little else. It is claimed by experts in microscopy that they can distinguish the difference between the cells of benign and malignant tumors, which may be safely admitted in cases where other sources of information leave no doubt in regard to the character of the disease, but in obscure and complicated cases the revelations of the microscope alone can not be fully trusted. In the examination of pus and blood-globules, of epithelium, spermatozoa, animalcules, fungi and many other minute objects, the microscope is invaluable in the hands of those who have had practical experience with the instrument. The ophthalmoscope, the laryngoscope, and specula of various kinds are in use to assist in diagnostic science. The stethoscope is useful in determining aneurismal sounds and respiratory rales, as well as beating of the fœtal heart in suspicious abdominal tumefactions. The sphygmograph is attaining some importance as a diagnostic instrument, and the thermometer has a settled place and acknowledged value.

The fluid contents of an abscess are usually ascertained by the sense of touch, a feeling of fluctuation being imparted to the finger, but in doubtful cases the exploring needle is brought into requisition. In cases of ascites it is not always easy to discover by the tactile sense whether fluid exists in the peritoneal cavity or not, but in the majority of instances the fluctuating impulse can be detected if both hands be used upon the walls of the abdomen.

When the walls of a cystic tumor are very thick, the fluid contents of the sac may not be discoverable by the fluctuating impulse. I once was in doubt whether a tumor in the parotid region as large as the fist and firmly fixed, was removable or not. The character of the tumor was presumed to be fibrous, but the use of an exploring needle decided that it was cystic, with thick parieties. Of course, there was no longer a question in regard to the practicability of removal.

The aids that chemistry can bring to assist in surgical diagnosis are not numerous. In urinary diseases a few chemical tests are exceedingly valuable. So much progress is being made in organic chemistry at present that a rational hope may be entertained that still greater assistance may be derived from it in future for diagnostic purposes. The use of litmus paper in determining the acidity and alkalinity of saliva, urine and fluid discharges from the body, should be more common than it is. The specific characters of septicæmic poisons may yet be discovered, together with preventives and antidotes.

SURGICAL INSTRUMENTS.

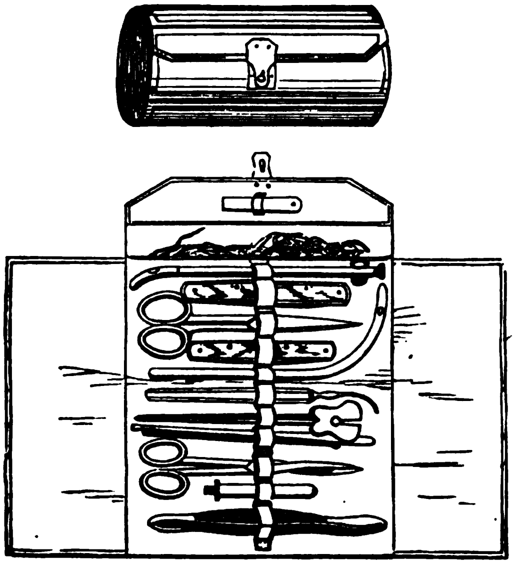
As a matter of convenience, surgical instruments have been arranged in sets and packed in leather or wooden cases. The commonest of these is the ordinary pocket-case, which is carried by almost every physician in his daily round of practice; next in importance for general surgery is the amputating-case, which, besides a tourniquet, saws, bone-nippers, amputating and a variety of knives, often embraces trephining instruments, polypous and gouge-forceps, tenacula, scissors, catheters, sounds, trocars, a limited set of eye-instruments, as well as those necessary to perform lithotomy.

While these instruments would answer to execute the plainer operations of a general character, whether small or large, it requires a vast number of implements, peculiar in construction, for special departments in operative surgery. The oculist, for instance, needs to invest from a hundred to a thousand dollars in instruments necessary to successfully pursue his specialty. The closure of vesico-vaginal fistulæ requires a variety of instruments made especially for that purpose. Lithrotrity can not be performed without expensive implements which are forged, fashioned, and highly wrought for that purpose alone—a lithotrite costing twenty-five dollars is useful only in crushing stone in the bladder. The tonsils can not be excised without a tonsilotome—a complicated instrument made specially for their excision. Necrosed bone can not well be removed without drills, chisels, and gouges in multiple shapes and sizes. The chain-saw and the ecraseur belong to a surgeon's armamentarium; a stomach-pump, an Esmarch bandage, a hypodermic syringe, and a variety of anal and vaginal specula, throat and ear mirrors, body thermometers, and explorers, constitute a few of the surgical instruments not usually combined in methodical sets, yet may be assorted and arranged in cases. Strictures of the urethra, which are narrow, tortuous and callous, can not be treated successfully with bougies, therefore a set of permeators, dilators and cutters, such as are embraced in Maisonneuve's case, must be in the possession of every surgeon who commands a wide range of practice. And, what is more, he must as constantly add to his stock newly devised or improved instruments, as he does recent publications to his library.

THE POCKET CASE.

The accompanying diagram represents a leather case, filled with surgical instruments. It folds into a package that can be carried in the hip or pistol pocket of the pants; or in one of the

FIG. 1.

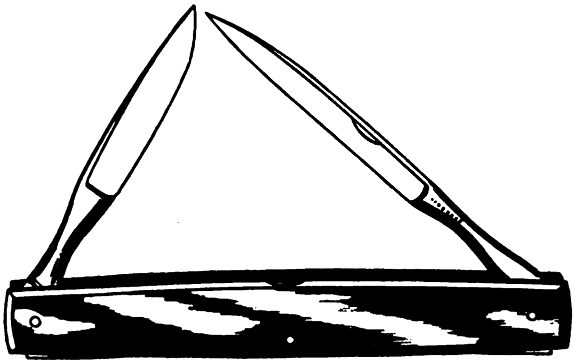


Pocket Case.

pockets of the coat. The lower diagram shows the contents of the case, the instruments being held in place by loops of tape or thin leather. The case also has a pouch, in which needles, ligatures, silver wire, and a small supply of adhesive plaster, may be carried.

The first instrument represented is a female catheter which is sometimes convenient in obstetric practice; and extending upward from the bottom of the first fold, is the part of a male catheter which can be joined to a part of the female catheter, and thus constitute a complete instrument. It is called the "combination or compound catheter," and is of sufficient practical utility to command a place in the pocket-case, though, where catheterism of the male is difficult, other catheters will be needed. Two double knives are found in the pocket case that bears my name; at one end of the handle is hinged a straight bistoury, and at the other a scalpel-blade. The bistoury is useful in a thousand operations; and the scalpel serves to remove large tumors and to amputate the mammary gland. The bistoury is particularly applicable for the opening of abscesses and fistulas. The blades of this double knife, when open, are as firm in the handle as if riveted there. Nothing is more perplexing than a cheap case of instruments, having knives which need to be fixed with a sliding ring or other unreliable contrivance. Such a case may appear surgical to the unprofessional, but it is practically worthless.

FIG. 2.

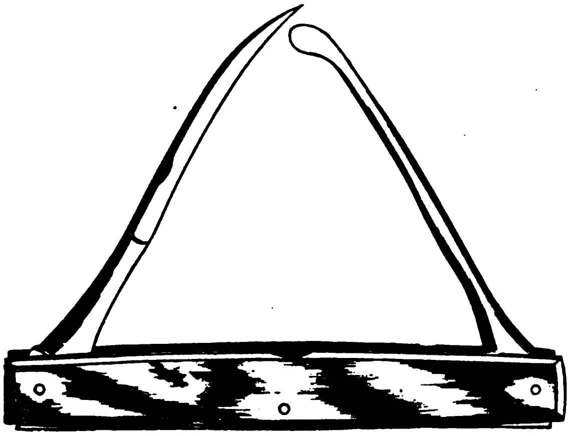


Scalpel and Bistoury.

The second double knife has a sharp-pointed curved bistoury in one end, and a gum-cutter in the other. The latter is convenient as a vaccinator. The curved bistoury is useful for opening abscesses and otherwise saving the straight instrument in delicate operations.

An exploring needle is a valuable addition to a pocket set of instruments. The grooved needle explorer is better than none, but I much prefer one which is made like a slender trocar and canula. When there is doubt in regard to the contents of a tumor—for instance, a hydrocele—the explorer can be sent in, and a few drops of fluid taken out for examination without inflicting serious harm in the event a mistake has been made in the diagnosis. If the tumor should prove to be hernial, death would not follow the delicate puncture. When it is not easy to diagnose a tumor of the abdomen the exploring instrument can frequently be employed with the greatest diagnostic satisfaction. I have sent an exploring needle into an aneurismal tumor in a case of doubt, and inflicted no injury; though the practice is not to be commended when the diagnosis is clear without an exploratory wound.

FIG. 3.



Curved Bistoury and Gum-cutter.

Two or three silver probes should be embraced in a pocket case of instruments; one with an eye can be used to drag a seton into place; as well as be employed in many instances to explore fistulous tracks and sinuses, and in finding the depth, direction and extent of wounds, especially bullet wounds. A smaller silver probe, thick at one end and slender at the other, has a place in tracing the canaliculi of the lachrymal apparatus, and in following the course of minute fistulous tracks.

Two grooved directors are indispensable; one should be silver, having a spatula at the end used as a handle, and in this should be a slot to go astride the frænum linguæ while cutting tongue-tie. The instrument should have a probe-like point at the other extremity, that it may be readily pushed between layers of tissue and along fistulous tracks. Being made of silver the instrument may be readily bent in order to follow tortuous tracks, and that it may the more readily be brought out of the anus when carried into an anal fistula. The iron grooved director is to be used when the intricacies of a case require the employment of two instruments of the same general character.

A pair of surgical scissors which need not differ essentially from the ordinary implement, occupies an important position in a pocket case. One blade may have a probe-joint, though that feature is not essential. The instrument should be strong, and in good condition. Scissors that will not hold an edge, are a source of vexation; even the best of cutlery in the way of scissors, soon gets dull, therefore the surgeon should frequently sharpen the instrument, or substitute it with a new article. It is employed to cut adhesive plaster, to divide umbilical cords, to fashion compresses and various kinds of dressings, and to snip off ragged or sloughing pieces of flesh. Inasmuch as scissors divide tissues in a crushing manner, like an ecraseur, their wounds do not bleed as freely as those made with a sharp knife, consequently they are coming more and more into use in the removal of tumors after the integument is incised with a knife, and in the freshening of surfaces that are to be joined with sutures.

A blunt hook for raising tendons in operations for the cure of strabismus may very properly have a place in the pocket set, though the instrument is rarely found in ordinary pocket cases. I have found it useful in exploring cavities in decayed teeth, and in seeking bits of broken glass, steel and needles, that have been forced into the palmar and plantar fascias. Chiefly for the latter purposes I have given the instrument a place in my pocket case.

Two pairs of dressing forceps are convenient; one is for extracting polypi and foreign bodies from the nasal cavities, bullets from superficial wounds, and for various manipulations of a minor character. The beaks are slender enough to pass through the female urethra, and the forceps may thus be employed to remove small calculi from the bladder of young subjects. They are not long and strong enough to remove a large calculus from the bladder of an adult female. I have introduced a pair of toothed forceps, with wide beaks or points, into my pocket case. The instrument is invaluable in seizing, twisting and mashing bleeding vessels, and in making a secure grip upon small tumors while excising them. In performing an ordinary dissection, I find the instrument exceedingly valuable.

Some part of the pocket case contains a lancet, yet at present there is little use for the instrument. Considering the important position the lancet once held in therapeutics, it should still occupy a niche in the pocket case, if for no purpose except that of historical significance.

THE AMPUTATING CASE.

The surgeon who would perform capital operations, as amputations, resections, and the more important operative procedures, must possess an amputating case of instruments. This in a restricted sense need not embrace more than two or three amputating knives, a tourniquet, an amputating saw, a pair of bone nippers, a tenaculum, and a few minor implements that also might be found in a pocket case; and such a set might be bought for fifteen or twenty dollars. But as the case would cost too much in proportion to its contents, and as the performer of amputations aspires to the execution of many of the larger operations in surgery, what ordinarily passes as an amputating case, embraces a variety of instruments which do not strictly belong to an amputating set. However, it rarely contains instruments for special purposes, the object of the combination or methodical arrangement being to bring together in a portable form, when cased and enveloped in leather, a set of instruments that will answer for general purposes. It is not essentially unlike what is called a "field-case" in military surgery.

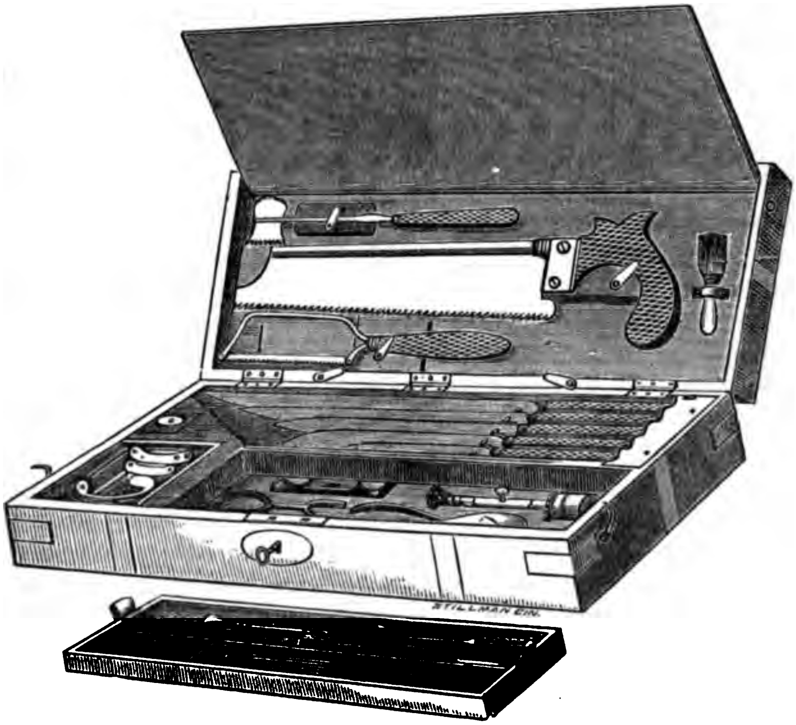
In a general set of the kind under consideration there should be three amputating knives, one blade being ten inches long, another eight inches, and the third six inches; and there should also be a heavy scalpel four inches long. There is no necessity for a catling, or double edged knife. The amputating knives should be stiff enough to resist springing much while in use. A very thin blade is as objectionable as one too thick. The longest blade is to amputate through the upper third of the thigh, and at the hip joint; the eight inch will do for the adult arm or leg;

and the six inch for children's limbs. The large scalpel is useful in disjointing the carpus and tarsus.

A pair of bone-cutting forceps may be employed to trim off spicula the saw may leave, and to divide the phalangeal bones, in place of what is called a metacarpal or phalangeal saw.

The amputating saw should have as much length as the amputating case will admit—commonly from twelve to fifteen inches. The teeth of the saw should be made to cut bone rapidly and easily.

FIG. 4.


STILLMAN CIN.

General Operating Case.

A tray of smaller instruments fits in the amputating case, and may contain a tenaculum, two scalpels of moderate size, a probe-pointed bistoury, and a curved bistoury with a sharp point. It may also have a pair of curved scissors for small operations, particularly strabismus; and a pair of depilating forceps, chiefly used in extracting "wild hairs" from the edges of the eyelids.

In some part of the case there should be two or three trocars, one of small size to evacuate hydroceles, and may do in paracentesis of the thorax or abdomen, though the latter cavity holds so much fluid that too much time is consumed in emptying it through a small canula. A long and curved trocar is employed to tap the bladder through the rectum when catheterism is impracticable; its use is rare, but, when necessity calls, the instrument is indispensable. A very large trocar for emptying ovarian cysts does not belong to an amputating case of instruments.

A trephining set of instruments is usually arranged in an amputating case; and embraces, besides a trephine, a brush to clear the saw-like edge of the trephine, an elevator to pry up depressed pieces of bone, and Hey's saw—an instrument with a straight edge on one side and a convex edge on the other, and employed to remove a spiculum or prominence of broken skull, and thus save the use of the trephine. A pair of gouge-forceps may belong to the set or form a part of a general operating case. In the removal of carious bone, the instrument is invaluable.

In a trough or compartment of the tray there should be an aneurismal needle, and a variety of small implements, as pins, probes, silver wire for sutures, and ligatures of silk and hemp.

In some part of the case there should be a variety of metallic catheters, vesical sounds, a lithotomy staff, and a long bladed, probe pointed, narrow knife, to be used with the staff in performing lithotomy. The straight bistoury of the pocket case will do, but a regular lithotomy knife does better. Then, of course, the case must embrace a pair of lithotomy forceps for extracting the stone after it is cut upon. As boys are liable to vesical calculi, a lithotomy set of instruments should embrace a grooved staff of small size, as well as the large one for adults.

Inasmuch as the general instrument case is carried when surgical trips are made into the country where unexpected operations may have to be performed, it is well to have the collection of instruments embrace a few eye-instruments. One of these may be a cataract needle, to break up the capsule of the lens in congenital cataract; another should be Graafe's knife to perform Liebreich's operation, a third might as well be Beer's triangular knife, a fourth the lance-shaped instrument for iridectomy, then a pair of toothed forceps of delicate structure, and a slender pair of curved scissors. Desmarre's ring and plate forceps are necessary to hold the lower lid in an inverted state while a small tumor is being dissected from the lid through an incision made in the conjunctival lining—to save a scar in the tegumentary covering.

Other surgical instruments belong to special sets, or are of a nature not readily classified. It is well for a surgeon to have a leather bag, in which he can hastily pack a variety of instruments and implements that may be needed in an emergency. A box of ready-cut adhesive plaster, of various widths, should always be kept in the leathern pouch; also a supply of sponges, roller bandages, and a parcel of patent lint, should always be in the bag. A four ounce vial of chloroform is to be in readiness; and it is well to have a styptic at command. In the event of a railroad or other accident where many persons are liable to be injured at once, the surgeon, to be prompt and efficient in affording relief, must be prepared in advance to render the highest order of services in the nature of his professional avocation.

ANÆSTHESIA.

The earliest efforts of man to mitigate pain were not attended with a notable degree of success. Although much poetic fervor was lavished upon the narcotic properties of Nepenthes, and the soporific qualities of Lethe, it is not probable that the virtues of either were of any practical importance.

The Egyptians concocted potent agencies for alleviating pain, and the Greeks found that poppy-juice was a reliable narcotic. Indian hemp and "the deadly nightshade" were used in the composition of oblivious draughts. The Romans performed surgical operations while their patients were under the influence of stupefying drugs. But during several centuries following what is called the classic period of the world's history, little progress was made in the discovery of pain-alleviators.

In the twelfth century a Tuscan announced that suffering might be assuaged by the inhalation of narcotic vapors. He had a confection made which embraced henbane, hemlock, opium, and other vegetable agents which possess the power of benumbing the nerves. In the sixteenth century Porta, of Naples, devised a soporific medicine from certain narcotic plants. About a century later, Papin, a Frenchman, published a work on various methods of performing surgical operations without inflicting pain.

Humphrey Davy, while experimenting with several gases, discovered that the inhalation of nitrous oxide would alleviate pain, and declared that "it might probably be used with advantage during surgical operations." The discovery of anæsthetics was here foreshadowed, though many years elapsed before Soubeiran stumbled upon the formation of bichloric acid, "a heavy liquid," which was the true chloroform that Dumas re-discovered in 1835. The agent was regarded as a chemical curiosity, and of no practical importance.

In 1844, Horace Wells, of Hartford, made some experiments with Sir Humphrey Davy's nitrous oxide, and established the fact that the agent might be safely used to annul the pain incident to tooth-drawing. Dr. Morton, a dentist of Boston, who had been a pupil of Wells, employed nitrous ether in dentistry, and became instrumental in calling the attention of surgeons to the anæsthetic properties of the gas.

In 1847, Dr. Simpson, of Edinburg, engaged in a series of experiments with the view of discovering an anæsthetic. He used several of the hydrocarbons, and at length tried the "heavy fluid" of Soubeiran. This agent seemed to possess just the qualities he had been seeking, and he pronounced CHLOROFORM an anæsthetic.

Like most other discoveries, this had a long history. The world is always looking for something startling in the way of invention, but the fact is, that anything original and complete rarely comes suddenly. Scales of gold found in the sands of a great river would indicate that the precious metal might exist "in paying quantities" in the mountains near the head waters, but in following the stream upward the fortune hunter might stray into many barren branches before the right trail was struck.

Chloroform is a colorless liquid, having a pungent yet rather agreeable smell. Its taste is sweet and somewhat aromatic, though its caustic action upon the tongue is not pleasant. Its specific gravity is 1.48–49, and is miscible with alcohol and sulphuric ether in all proportions.

One of the valuable qualities of chlorofrom is its extreme volatility. Its volume is increased considerably in high temperatures, so that a greater quantity is required to produce anæsthesia in hot weather than in cold. There are several reliable tests for the purity of chloroform, but the surgeon relies chiefly upon the character of the manufacturer. At present, the products of Squibb, and of Powers and Weightman, are regarded as the best, though other producers may make just as pure and as heavy articles.

The amount of chloroform needed to produce an anæsthetic sleep sufficiently profound to suspend nervous sensibility, varies considerably among individuals of dissimilar ages and different degrees of impressibility. I have commonly carried two fluid ounces when I expected to use the agent, but having fallen short in a few instances I now carry three or four ounces. In some cases I do not have to employ more than two or three drachms, while in others as many ounces are used or wasted.

A patient may be chloroformed in a sitting or lying posture, the nature of the operation to be performed dictating in the matter. The recumbent attitude is undoubtedly the best, because the patient can be the easier manipulated after a state of insensibility is reached. It requires a strong person to maintain a limp body in a sitting posture, unless the chair be so tipped that partial recumbency is attained. A patient while under chloroform rests quite as easy upon the side as upon the back, and the position is often convenient for the operation. The head of the patient should be raised a little and rest on a pillow during the operation, or while under chloroform. The dress should be loose and easy, especially about the neck and chest. It is not necessary that a season of fasting should be practiced before taking chloroform, yet a full stomach is objectionable.

The patient, before going under the influence of chloroform, should, if possible, be free from apprehension and in a happy frame of mind. While these conditions are desirable, quite the contrary states are usually present. It is well, during the preparatory arrangements of an operation, for the surgeon to talk cheerfully and to divert the patient's mind as far as practicable. Too often the dread of chloroform and groundless apprehensions render the patient unfit to enter the anæsthetic state. Children too young and inexperienced to fear anything serious, take chloroform easiest, and undergo less danger from anæsthesia than adults. Grown persons will always question the surgeon about heart and lung affections which by them are erroneously supposed to constitute insuperable objections to the anæsthetic state; and the fear adds largely to the danger.

Everything being in readiness the surgeon pours a few drops of chloroform upon a folded linen or silk handkerchief, and holds it near the patient's nostrils. The first breaths are often attended by a choking sensation and an inclination to cough, as if to clear the throat and the larger respiratory passages. After a minute or two, more chloroform—a quarter of a teaspoonful or so— is poured upon the napkin and quickly held nearer the nose than at first. This will usually be received with less opposition than the previous application. In the course of two or three minutes a fresh dash of chloroform is to be poured upon the handkerchief and held near the mouth and nose without touching the skin. Usually the surgeon's hand which holds the napkin, rests on the patient's chin or forehead to keep it steady. While the patient is thus entering the anæsthetic state, the features and the respiratory movements are to be watched. At first the countenance becomes flushed; and as the deeper grades of anæsthesia are reached, an appreciable pallor steals over the face. A finger on the pulse takes cognizance of the heart's action. Chloroform excites the heart at first, then exerts a quieting influence upon it. But the approach of danger may come from the lungs, and is heralded by suspended respiration, livid lips, and ghastly pallor. The surgeon, knowing the peril, carefully watches a patient passing under the influence of chloroform, and is prepared to resuscitate the patient if danger threatens, or to operate as soon as insensibility is reached, which may be known by pinching the skin or by the approach of stertorous breathing. It is my custom to put the napkin in the hands of an assistant as soon as I discover that the patient enters well upon the anæsthetic state without untoward symptoms, for I wish to be ready to operate as soon as the insensible condition of the patient will permit; and while operating I never lose sight of the patient's countenance and respiratory movements for more than a few seconds at a time. I have frequently dropped a surgical instrument, and seizing the patient by the chest, shaken and turned the body until the suspended respiration was re-established—then finished the operation. The experienced surgeon is so quick to perceive a lowering of the patient's temperature, undue pallor, or untoward symptoms of any kind, that he instinctively flies to means of relief.

As soon as the patient arrives at an insensible state, or to a condition of stertor, no more chloroform should be administered, yet the assistant who has been giving the anæsthetic, should not leave his position, but be ready to administer a little more as soon as the surgeon orders it. Thus the insensible state can be safely prolonged until the operation has been completed; and when the pain-inflicting part of the operation is over, no more chloroform should be given, but the patient is left to recover consciousness by breathing off the poisonous vapor. Often a clear state of the mind will be reached before the dressing is finished. However, the restoration is usually slow, a disposition to sleep continuing for several hours.

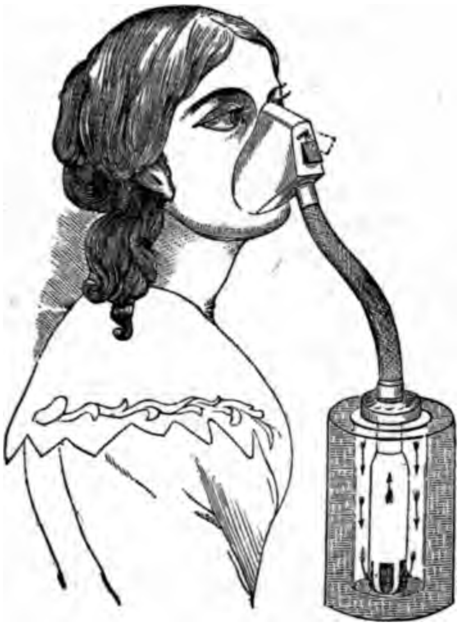
Vomiting is one of the complications which frequently attend the administration of chloroform; and when the patient is observed to be nauseated, and is retching, the conditions should be attended to. The head is to be turned so as to favor the escape of the contents of the stomach when they have reached the throat and mouth. Sometimes the finger is to be used in dragging the tongue forward and in emptying the fauces. The presence of vomited material in the glottis endangers the respiratory function. It is well to have a basin ready in every instance in which chloroform is used, as a provision against uncleanliness, and the waste of time necessary to procure a vessel. Vomiting usually comes on while the patient is taking the chloroform, or during the stage of recuperation. In either case the depth of the anæsthesia is not so profound as to greatly augment the danger; but if the act of vomiting occurs in the midst of the operation or during unconsciousness, great care must be exercised to prevent asphyxia. Vomiting never takes place during the profoundest state of anæsthesia.

Children and delicate females commonly pass into a state of anæsthesia without excited or violent demonstrations. Often a woman will laugh hysterically, sing, pray, and talk with a free tongue, yet she is rarely observed to say anything improper or vulgar. A man, especially if he be coarse and pugnacious, may give utterance to oaths and obscenity, or manifest a disposition to strike somebody with his fist. This exalted state of the sensorium only lasts a few minutes if the chloroform be continuously applied; soon a profounder stage of anæsthesia is reached, in which the garrulousness merges into an incoherent mumbling of words. In a few seconds more no sound is heard but that of deep sleep, or snoring, which is the indication to withdraw the chloroform.

In some cases the approach to an anæsthetic state is to be closely watched. The patient will seem to resist a state of unconsciousness for a long time, and then, all at once, sink into a profound state of hypnotism. I once saw a lad drop into a fearfully deep sleep in a few seconds, who had resisted the action of chloroform until the surgeon spoke impatiently to his student who was plying the anæsthetic—the hypnotism was so complete that no respiratory action could be discovered for two or three minutes, though vigorous efforts were made to excite the lungs to move.

Various instruments have been invented for the purpose of administering chloroform with certainty as regards quantity and atmospheric admixture. Dr. Snow, of London, who devoted the active part of his life to the investigation of anæsthesia, devised an apparatus for regulating and methodizing the administration of chloroform. A picture of his instrument is here given, to illustrate commonly accepted principles, which may be heeded with advantage by those who have been too reckless in their methods of administering chloroform. Though the apparatus be not adopted or employed, the ideas involved in its construction and use are worth considering. The essentials of the apparatus are a metallic vessel in which chloroform is contained, and through which air passes, thus carrying the chloroform along with it; a tube which conveys a mixture of chloroform and air to the face-piece; and a flexible mask, fitting over both nose and mouth.

FIG. 5.



Snow's Chloroform Inhaler

The vessel containing the chloroform is a metallic cylinder, in which are four stout wires descending nearly to the bottom. These are removable, and around them are two coils of blotting paper, cut (after being tied upon the wires) into four slips. The upper part of the cylinder is perforated with holes for the admission of air, and the exit tube is attached to the top, the framework on which the blotting paper is tied forming a continuation with it.

Thus, when air is drawn through the tube a number of currents pass through the apertures in the course of the arrows, over the blotting paper moistened with chloroform, and then enter the exit tube. Hence the air which is inspired from the tube becomes impregnated with chloroform, the certainty of sufficient dilution being provided for by the free perforation of the plate through which it enters. But Dr. Snow, considering that the evaporation of chloroform gave rise to cold, whereby the further evaporation was impeded, adopted a means for surrounding his chloroform-containing cylinder with a body which should supply a sufficient amount of heat. The metallic cylinder was therefore surrounded with a stratum of water (of ordinary temperature) contained in another cylinder, an arrangement like that of a glue-pot.

The tube carrying the vapor is about a foot long; its diameter is about three quarters of an inch, so that it may permit the passage of as much atmosphere as the patient can possibly breathe. Its length and flexibility allow the instrument to be turned anywhere out of the operator's way.

The *face-piece* is made of pliant material (leather or sheet lead). It is provided with two valves, one at its lower part, *i. e.*, at the summit of the tube carrying the chloroformed air, which allows the vapor to enter, but prevents the patient in expiration forcing air back again down the tube; another valve is provided, which is made to cover an aperture in the front part of the face-piece. This is made movable, so as wholly or partially to close the aperture, or to be turned away from it altogether. When it closes it is a perfect expiratory valve, thrown forward in expiration, and allowing the current to escape, but sucked inward in inspiration, and thus permitting only the entry of chloroformed air through the other (inspiratory) valve.

While the apparatus of Dr. Snow, and many other inventions of a similar character, may be useful in a hospital, they are not sufficiently simple and portable for general use. Then, again, the cost is too great for those practitioners who may not have occasion to use chloroform more than two or three times in a year. Finally, is it safe to estimate that a complicated apparatus like that of Snow, will always give off or furnish a vapor which contains four or five per cent. of chloroform? Moreover, all patients do not require the same degree of dilution for the anæsthetic agent they inhale; and many would object to having their mouth and nose covered with a face-piece that prevents talking in the early stage of the procedure (often a great privilege), and seems to abridge ordinary movements of the body. Besides, strong men in the pugnacious stage of anæsthesia, often take a fancy to break the apparatus, and occasionally succeed in spite of restraint.

The mixing of chloroform-vapor and air in a balloon or bag, is attended with trouble as well as uncertainty, and the receptacle is often in the way of the operator. Furthermore, the per cent. of chloroform is the same at the beginning and the end of the process of anæsthetization, unless several bags of vapor of different strengths be prepared beforehand, which would be impracticable in most instances.

It will be seen, then, from what has been said, that the *impromptu* method of administering chloroform, is not likely to be supplanted by the invention of complicated and costly inhalers—especially as statistics fail to show that such apparatus is safer than simpler means. In fact, the reported death-rate is a trifle higher when intricate inhalers have been employed. However, records are more accurately kept in hospitals and institutions where inhalers are exclusively employed. Many deaths from chloroform which occur in the country do not get reported, and such usually happen when no special apparatus is used.

The method I generally follow, is that in common use. A soft linen handkerchief is folded into several thicknesses, four or five inches square. This is curved or bent into a hollow, like that of the hand when the fingers are semiflexed. Into this nest a drachm or less of chloroform is poured, and the cancavity is held over the nose and mouth at a distance of an inch or so at first, and nearer after a few breaths have been taken, and the irritative cough, which may have been provoked, has subsided. This process freely admits a due proportion of air, and gives the patient an opportunity to see what is going on, as well as to talk and spit. Men who are in the habit of expectorating a great deal, seem to be seized with an irresistible desire to spit while inhaling chloroform. In the event that a patient exhibits unusual power to resist the action of chloroform, the napkin may be quite freely saturated, and then held close to the nose and mouth. An inexperienced chloroformist may be so fearful of giving too much that he may fail to subdue his patient, or he may be so bold and reckless that he may plunge his patient into a coma dangerously profound.

Considerable chloroform may be saved by pinning a napkin upon a sheet of paper, and then rolling the two into the form of a cone, the lint or absorber being on the inside. The open end covers the mouth and nose, and admits plenty of air. I have seen a napkin pushed into a goblet or tumbler, and then used like the cone just described, but for reasons attained by considerable experience, I am free to express my preference to the folded napkin already mentioned. The cost of a few drachms of wasted chloroform is too trifling to lead me to adopt economical means which in a variety of cases have not proved entirely satisfactory.

The dangers of chloroform are from several causes or conditions; and among these, three of the most prominent may be mentioned: the *first* is from paralysis of the respiratory functions—death occurs from asphyxia or suffocation; the *second* is from cardiac troubles—the fatal issue coming from spasm or paralysis of the heart; the *third* is from coma, or a too profound action of the anæsthetic. This form of death may be avoided by care on the part of the chloroformist, but the other two causes of death are accidental, and attributable to an abnormal condition of the patient. Under such circumstances the chloroformist, if he have manifested due care and watchfulness, is not responsible for the fatal issue. When death takes place before insensibility is established, the heart is usually the organ at fault. The chloroform may act in such cases as an irritant, and throw the heart into a clonic spasm; or it may paralyze the muscular walls of the organ, leaving the cavities in a dilated state. Sometimes a patient dies before the vapor of fifteen drops of chloroform has been inhaled; and whether the death results from spasm or paralysis of the heart, the prospect of resuscitation is not flattering.

When death occurs during the full effect of chloroform, the lungs are generally paralyzed and congested. The blood becomes over-charged with carbon, which can only be relieved by respiration, and that function gets more and more stupefied through lack of aeration. In such a case there is hope of resuscitation if the means employed be efficient. It does little good to dash water in the face, to slap the hands, and perform other similar acts, for the patient's nerves are too profoundly benumbed to be impressed; even under a less profound state of insensibility the amputating knife would not be felt, then how thoughtless it would be to attempt resuscitation with less impressive means! If artificial respiration be kept up for a few minutes, enough of the chloroform-vapor and the carbonic acid gas may pass off to insure recuperation.

It is generally supposed that diseased conditions of the heart and lungs forbid the use of chloroform. Patients about to have a surgical operation performed, are apt to consult their physician in regard to cardiac and pectoral troubles, and if told that they should not incur the risk of chloroform, they oppose its use and submit with grave apprehensions, and the terror adds to the danger. Autopsies held after death from chloroform, show that the greatest peril comes from fatty degeneration of the heart; and that is unfortunately a state of the organ which can not be very clearly determined during the life of the victim. In valvular diseases of the heart, chloroform may be administered without great risk. Many cardiac difficulties temporarily cease as soon as an anæsthetic begins to take effect.

In diseased conditions of the lungs, unless there be acute congestion, the action of chloroform is generally favorable.

In cases of anæmia from cancer, necrosis, and most other devitalizing diseases, anæsthesia is not objectionable. In epilepsy, puerperal eclampsia, tetanic states, and the convulsions of childhood, chloroform acts efficiently and kindly. In hysterical paroxysms the use of chloroform is highly beneficial, though it should be administered slowly. Hard drinkers do not bear anæsthesia well. Probably the high rate of fatality among such comes from fatty degeneration of the heart. Chloroform should be administered with great caution to persons affected with delirium tremens.

There is no serious objection to the employment of chloroform in obstetricy, though the danger is too great to admit of its use in ordinary cases. Chloroform kills as often when administered to extract a tooth, as when given to amputate a leg. In fact the mind is left to the dread of the anæsthesia in a trivial operation, and is diverted by the preponderance of a more difficult piece of [illegible] accounts for the fact that more deaths [illegible] of chloroform when given in minor [illegible] administered in more important cases. [illegible] in swelling the death-rate.

[illegible] encounter pain that they often demand [illegible] influence of chloroform when about [illegible] operation, consequently surgeons are often [illegible] with the wishes of their patrons when they [illegible] dangers of chloroform should not be undergone. [illegible] small amount of chloroform is given just to [illegible] demands of the patient. But this is not [illegible] three breaths of chloroform vapor have [illegible] When only partal anæsthesia is produced the [illegible] but not entirely abolished.

[illegible] require profound anæsthesia, as the reduction [illegible] hernia by taxis, and the return of a dislocated [illegible] muscular subject, yet for the performance of [illegible] operations the stertorous stage of anæsthesia need [illegible]

[illegible] upon when partially anæsthetized may [illegible] thereby leading sympathizing friends to suppose [illegible] experienced, yet the patient upon recovery from [illegible] chloroform will acknowledge that no pain was [illegible] there is insensibility without entire uncon[illegible] The patient knows that the operation is going on, [illegible] agony, yet feels nothing.

[illegible] heart's action, indicated by a sudden flagging [illegible] pulse; and a suspension of respiration, with [illegible] signs of an appalling character, and com[illegible]. The inhalation of chloroform is to [illegible] and efforts are to be made to resuscitate [illegible] cold water and slapping of the hands, as [illegible] good; but turning the patient upon [illegible] finger deep in the throat to remove collec[illegible] material that is vomited, may clear the way for [illegible] must be kept up artificially. While the patient [illegible] the chest is to be turned every few seconds [illegible] and heavy slaps are to be imparted to [illegible] the scapulæ. Blowing in the mouth is [illegible] performed, and the turning and slapping [illegible] minutes the finger is to be forced deep into the pharynx, and the tongue pulled forward as the digit is removed. Efforts of the nature above described are to be kept up until no hopes of resuscitation remain. The manipulation favors a return of the heart's action, and respiratory changes. If a feeble vital spark can be kept unextinguished there is a possibility of resuscitation. I once worked over a child for an hour, and my labors were rewarded by complete recovery. A little boy swallowed a drachm or so of chloroform that a servant girl with an aching tooth had left in his way. He descended a flight of stairs and walked half way across a room when he fell insensible and unconscious as if dead. I handled the patient as already indicated, with the additional maneuver of lifting the child by taking hold of the arms close to the chest, and bouncing him heavily upon my lap. This movement caused a sound of the larynx as if air passed through that part of the respiratory apparatus. In handling several patients who have exhibited startling symptoms while taking chloroform, I have always succeeded in resuscitating them by the method announced. The application of a galvanic current to the phrenic nerve in the root of the neck, has been extolled as a means of resuscitating persons overcome with anæsthesia, but I have little faith in it as a means that can be employed in a time of urgent need. It is often a fault with galvanic batteries that they persistently fail to act when their influence is most needed—an instance of " the perversity of inanimate things."

Puncturing the heart with needles, galvanizing the pneumogastrics, and performing other extravagant acts to restore the heart's action, have failed to accomplish any permanent good. As already suggested, artifical respiration is to be kept up; and the movements imparted to the lungs cause the heart to oscillate. To establish respiration is to favor the heart's action.

I have never tried forcing air into the lungs by means of a bellows, then expelling it by pressing upon the chest, to keep up artificial respiration, yet I believe the plan to be feasible and of some practical benefit. Reasonable as the method may seem, I should be unwilling to risk it for the plan I have found to work so admirably in cases of asphyxia from several causes.

I can appreciate that artificial respiration might be kept up through an opening made in the trachea, catheters or other tubes being employed as conductors of air.

Little good could be accomplished by the use of stimulating

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enemas, or mustard cataplasms to the soles of the feet; but I commend friction of the skin, which is to be directed from the fingers and toes towards the trunk.

The danger attendant upon the administration of chloroform has initiated a search for a safer anæsthetic. First among the experiments was the mixture of sulphuric ether with chloroform in equal proportions; but in time a death occurred from the administration of the compound, then another, and so on, until the combination was considered but a little safer than pure chloroform; besides, being less pleasant and sometimes too weak to affect a strong person, it failed to supplant the hold chloroform had got upon the profession.

Sulphuric ether in its simple state was next tried, and, on account of its comparative freedom from danger, has gained the preference with some surgeons. It is less potent than chloroform, and quite disagreeable to inhale. While I believe the agent is steadily gaining supporters in various large cities, I do not believe it will ever supplant the use of chloroform among practitioners in general. I once tried to anæsthetize a muscular individual in order to reduce a dislocation of the shoulder, using sulphuric ether. I could get the patient into a fighting mood, but could not render him insensible to pain—the agent was not potent enough to relax the muscular tissues, his arm remaining as rigid as ever. The vapor of chloroform subdued him in a few minutes. There have been a few deaths from the effects of sulphuric ether; and if the agent ever gets into general use, the death-rate will approximate that which attends the use of chloroform.

Nitrous oxide is an anæsthetic less disagreeable than sulphuric ether, and less potent, consequently less dangerous, yet now and then a death occurs from its use. A serious objection to its general use is the fact that it has to be administered from a bag or balloon-like receptacle; and has to be made fresh for every case. It may do for hospital practice, where a large quantity of the gas may be made at once, and used upon several patients who may be waiting for operations. Dentists sometimes keep a reservoir of the gas in their offices all the time, from which they may draw supplies for those who apply to have teeth extracted.

The bichloride of methylene is an anæsthetic of recent introduction to the profession; and from its safety, efficiency, and not unpleasant odor, is likely to grow into favor, in hospital practice.

But as a costly and bulky apparatus is needed for its safe administration it is doubtful whether it ever becomes the successful rival of chloroform. Two or three deaths have already occurred from the use of the agent, therefore what was promised for it at first, viz., great safety, is not likely to be realized.

So many persons are on the brink of the grave, although apparently in good physical condition, that it is highly probable any agent possessing sufficient potency to produce anæsthesia, will occasionally be attended with fatal results. Soon after Mr. Simpson began to use chloroform as an anæsthetic, he put a boy upon the operating table to remove a calculus from the bladder; and pouring some chloroform upon a sponge he started towards his patient to administer the anæsthetic, but to his astonishment the lad was dead—had died of fright, heart disease, or something else. Now, if the chloroform had been given in never so small a quantity, the presumption would have been that the anæsthetic caused the death. In fact, the fate of chloroform might have been sealed by so untoward an event.

I have administered chloroform over three thousand times, and have been so fortunate as not to have a death occur from the anæsthetic. This career of good luck is no assurance that I shall always escape the unpleasant occurrence of having a death from chloroform. On the other hand, according to the law of averages, I am near the disagreeable event. But the history of the effects of chloroform is so well known that two or more fatal issues in a year would not for the first time awaken me to the dangers of the agent, nor shake my faith in its matchless qualities as an anæsthetic.

INFLAMMATION.

If a physician upon the witness stand were asked to enlighten the court by defining inflammation, he would not think he had a hard task to perform; he might be flippant in recounting the phenomena of inflammatory conditions, which are more or less familiar to even the unprofessional, yet be unable to give a rational idea of the essential character of the disorder. He might say that inflammation was a local derangement, attended with heat, redness, pain and swelling; but such an answer would not throw much light upon the subject.

Mr. Paget, while speaking of the "Phenomena of Inflammation," in his "Surgical Pathology," says: "I shall not attempt to define inflammation in any set terms; for as yet we are not, I think, in a position to do this. Just definitions can not be made in any science till some of its broad and very sure principles have been established. Such principles we can not boast to have attained in the study of pathology; and the attempts at precise definitions that have been made hitherto, seem to have led to confusion or to false and narrow views of truth. Besides, to define inflammation is the less necessary, because, practically, we all know sufficiently well what the term implies. The very difficulty of exactly defining the process of inflammation may be our guide to the most hopeful method of investigating it. When we see such gradual transitions from the normal process of nutrition to the disease of inflammation that we can not draw a definition line between them, we may be sure that the main laws of physiology are the laws alike of the disease and the healthy processes; that the same forces are engaged in both; and that, though interfered with by the conditions of the disease, they are not supplanted or annulled."

Inflammation is a term which has become naturalized in science, therefore it would be difficult to introduce an available substitute, even if a change in phraseology were desirable. Etymologically the term comes from *in* "within," and *flamma*, a "flame," or "fire"; therefore in signification it is somewhat metaphorical. To be sure, there is an increase of heat in a part which is inflamed, but as this is only one phase of inflammation, and a blushing face has more than usual warmth, it would not be correct to say that a part was inflamed because it was unusually hot. It would be as rational to declare a neuralgic state to be inflammatory simply because it was painful, pain being a characteristic of inflammation. But when a part is hot, painful, flushed and swollen, it is in accordance with the ordinary use of language to say that inflammation exists.

The condition of an inflamed structure is at variance with that of health, though the natural functions are still carried on; the morbid action is manifested by a disturbance of the vital operations; a part inflamed is still subject to organic laws, but the conditions necessary to health are modified and perverted; disease is a burden inflicted upon a healthy career, and has to be endured until it can be shaken off.

Inflammation can exist only where there is vital activity; a gangrenous foot can not inflame; and a part of the body which through violence has lost its vitality, is not susceptible of inflammatory action. A knuckle of intestine thoroughly strangulated will not inflame though buried in living tissues, because cut off from vascular supplies through which vitality is maintained. The isolated intestinal loop becomes gangrenous without passing through the inflammatory process—it can not inflame because vital activity in the part is arrested. But if the constriction be overcome before gangrene takes place, the vital functions may be restored, and then inflammation can spring from the violence inflicted while the strangulation existed.

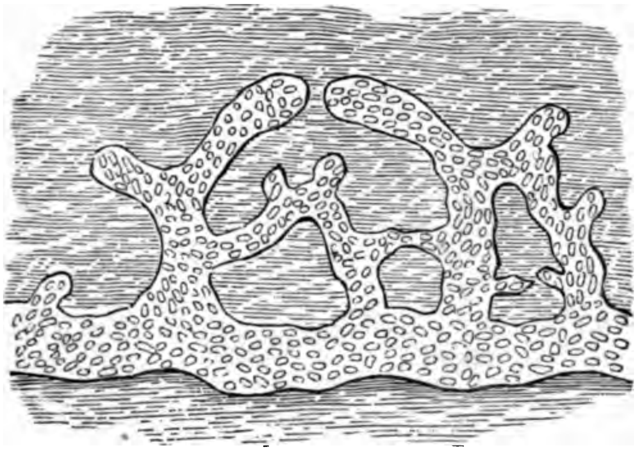
Inflammation is a pathological condition which is very extensive in its manifestation; it is a prominent feature of almost every surgical disease. Though oftenest exhibited in the outer structures of the body, it is not restricted by site or cause. None of the viscera nor deeper parts of the body are exempt from its influence. When the entire organism is impressed by the range of the morbid action, an inflammatory fever is established which does not differ from ordinary febrile states; there will be rigors, thirst, accelerated pulse, hurried respiration, furred tongue, deranged glandular action, cerebral disturbance—in fine, all the phases which exhibit themselves in ordinary fever.

Local inflammation is best described by fixing the attention upon some familiar form of external disease, say a furuncle or boil. A circumscribed spot on the surface of the body becomes swollen, painful, red, and hot; and a phlegmon the size of a pea or larger is the object. It enlarges from day to day, and the morbid forces are most violent during the increscent stage; at length the centre or apex of the tumor softens, and upon pressure with the finger a sense of fluctuation is experienced—there is an accumulation of purulent fluid in the central region of the boil. At last the skin becomes attenuated where the furuncle " heads," and, bursting, allows pus to escape from a cavity within. The disease now seems to have passed its acme of rage, and a season of subsidence follows, during which the lymph that exuded from the vessels and contributed chiefly to the tumefaction, begins to be absorbed; and the cavity, emptied of pus, commences to fill with new material in the shape of granulations. In the course of a week or two from the origin of the disease the chasm produced by suppuration is repaired, and the evidence of disordered action has ceased. The restoration is complete; but if the seat of disorganization and reparation be dissected and carefully inspected, a change in the vascular arrangement of the part may be discovered. And here it may be interesting to inquire what changes took place during the progress of the morbid career. In the first place a follicle in the skin became obstructed or a lymphatic in the subcutaneous tissue got deranged, and a morbid action was in consequence provoked. At any rate, there was a beginning of disordered action and a cause for it, whether discoverable or not. It is probable that the nerve filaments were first impressed; and they then influenced the capillary blood vessels of the part. The nerves have much to do with the circulation of the blood. Defective nutrition follows the injury of a nerve—ulceration and atrophy often attend the withdrawal of nerve force. As soon as the delicate nerve filaments felt the presence of the obstacle, the capillaries responded by bringing larger currents of blood to the region, and by discharging serum through their sieve-like walls. The obstruction grew rapidly from an unappreciable point to a pin head's size, then to that of a pea, and perhaps to that of a pullet's egg. The tumor is composed of enlarged and engorged blood vessels, and of exuded serum and lymph. The pressure on the sensitive nerves, and the acrid nature of the over-heated effusions produce the pain.

At a central region of the tumor the pressure arising from textural infiltration, nearly arrests the circulation, so that a state of decomposition sets in; and a liquid debris or purulent fluid takes the place of what was originally solid tumor. The liquifying process is necessitated by the heat and the abundance of effused fluid, and globular bodies of a cellular character begin to float freely in the putrescent liquid. These are pus-cells, which by the aid of a microscope can be distinguished from the whey-like fluid and granular matter mingled together. The pus-cells were once lymph-cells, and lost their vitality by getting too far from living tissue, and by imbibing putrefactive fluids. They can not readily be distinguished, either by their size or general appearance, from true lymph-cells; they are best known by the company they keep. Lymph-cells cling together, and adhere to granulations or living textures, while pus-cells mingle in putrefactive fluids.

Minute specks of flesh, called granulations, spring from the walls of the chasm produced by the putrefactive and liquifactive processes. A granulation is formed by the blending of lymph-cells and nascent blood-vessels. The lymph-cells form from plastic material exuded from vessels ramifying in the vicinity; and nascent vessels are those which bud or grow out like vegetable shoots from the walls of capillary trunks that happen to be nearest to masses of lymph-cells. The budding process is an essential feature in the work of repair. Without it a granulation could not be formed, nor vital operations be carried on in a nascent structure. New vessels are formed as follows: In accordance with an organic principle, a bulging takes place at some point in a small vessel contiguous to an accumulation of freshly exuded plastic lymph or newly formed lymph-cells. This extends itself by the vital properties inherent in the bud or shoot, and blood currents occupy its cavity and keep it distended, in fact, aid in its growth. At a short distance from the primary bud, another bulging takes place, and a second bud or shoot forms. These find their way into masses of lymph-cells, as rootlets do into genial soil; and by an unerring law of organization, they approach each other in curves, and after meeting, they reciprocally coalesce or inosculate, making one continuous trunk, through which a current of blood flows, collateral circulation being established at some distance from the parent trunk. This new vessel buds in turn at different points, and the shoots reaching each other, blend,

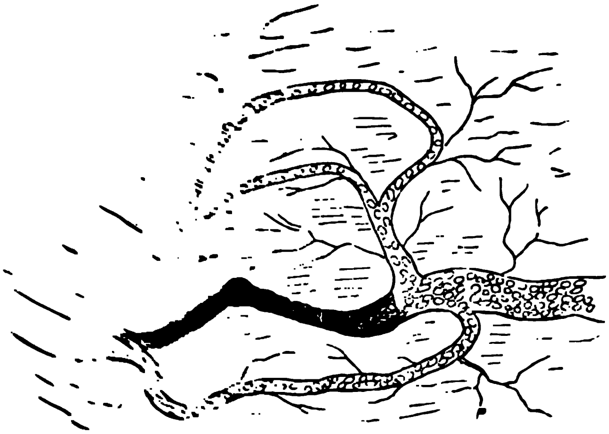
FIG. 6.



Nascent or budding vessels making their way into plastic lymph.

[illegible] network of newly made [illegible] produced by suppuration. [illegible] process leads to the formation [illegible] the vascular production [illegible] of vessels in all parts of the [illegible] be closely examined, or any [illegible] have been artificially injected, [illegible] vascular display among the small [illegible] arrangement may be seen in an [illegible] a bat's ear.

FIG. 7.

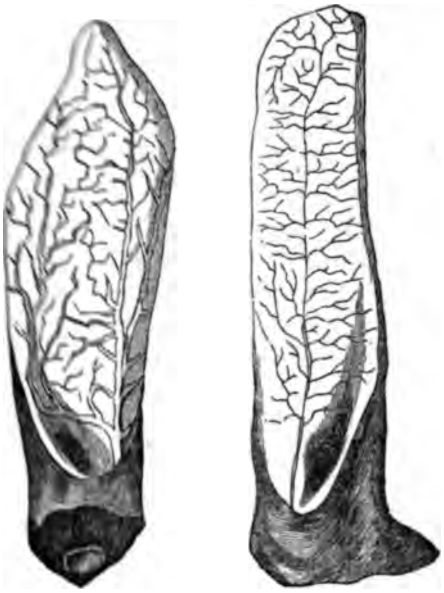


[illegible] enlarged branches after main trunk is obstructed.

[illegible] effects of violence upon the local circulation [illegible] in the membranous wings, webs, and ears of [illegible] A bat's wing in a good light reveals the [illegible] and if a lens of considerable power be [illegible] the observation, the blood corpuscles can be [illegible] are moving along in their accustomed channels. [illegible] the observation, if a needle be made to inflict [illegible] across the course of the vessels, a shock seems to [illegible] to the nerve filaments of the part, and the effect is [illegible] conveyed to the walls of the vessels, which exhibit the [illegible] have received by contracting and appreciably [illegible] vascular calibre. The result is that the blood cur[illegible] checked in their career, refluent waves are produced, [illegible] and stagnation occur. The blood corpuscles in their agitation seem to seek escape from the obstruction by finding the nearest branches through which to reach their destination by a roundabout way. In a few minutes the shock passes off, and relaxation of the vessels follows the temporary contraction. The blood now passes along as if nothing had happened; but if the violence be more severe, say the scratches be made with a hot needle, so that the coats of the vessels are scorched, then there is more than temporary irritation, an inflammatory condition is established, and the circulation of the part is interrupted, and perhaps changed in its course. Corpuscles of blood become stranded along the inner surface of the vessels; and for some distance there is a pouched condition of the vessels observed, as if under the control of disturbed and irregular nervous action. The membrane near where the violence was applied, grows opaque, there begins to be an effusion of serum from the disturbed and distended vessels which thickens the tissues. The stranded and stagnated corpuscles adhere together, and lose their florid hue; they appear like dead granular masses, and at length decompose and disappear by absorption. But the circulation in the immediate vicinity does not cease; at a little distance from the point where the violence was committed, the moving blood finds a vascular branch and follows it till the twig anastomoses with another twig on the other side of the obstacle. The twigs and branches enlarge and carry many times as much blood as originally circulated in them. The old trunk shrinks and becomes a fibrous cord; but as soon as it was obstructed, minute branches enlarged and anastomosed until they could bear the amount of blood accustomed to circulate in the part. In fact, the main artery leading to the locality carries an unusual quantity of blood to the region, and the anastomosing branches have to conduct it past the obstacle. The heart, by a reflex action of the nervous system, is influenced to throb stronger and oftener, and through a selective influence sends more blood to an inflamed region.

John Hunter made some experiments to show the effect of irritation and inflammation upon the circulation. He says: "Parts inflamed, when compared with similar parts not inflamed, show a considerable difference in the size of the vessels, and probably from this cause bring an increased number to view. I froze the ear of a rabbit and thawed it again; this excited considerable inflammation, an increased heat, and a considerable [illegible] of the part. This rabbit was killed when the ear was at the height of inflammation; and the head being injected, the two ears were removed and dried. The uninflamed ear dried clear and transparent, the vessels were distinctly seen ramifying through its substance; but the inflamed ear dried thicker and more opaque, and its arteries were considerably larger."

FIG. 8.



Rabbits ears. The greater vascularity of the one is produced by inflammatory action following a freeze.

In another place the author quoted previously says: "It is curious to observe how vessels become enlarged upon any irritation, not only the arteries but the veins, and not only the smaller branches but the larger trunks. This was evident in the following case: I applied a caustic to the ball of the great toe of a patient every other day for more than a month, and after each application the surrounding parts put on a blush, and all the veins on the top of the foot, as well as up the leg, immediately began to swell, and became large and full. This was so remarkable that the patient watched for this effect on the days on which the caustic was applied, from its happening only on those days."

In this connection may be mentioned that a part of the body can receive an undue quantity of blood, yet not be inflamed. When the cheek is flushed with shame and embarrassment, there is a temporary congestion of the face, but no inflammatory action; and erectile organs, when excited, receive a larger supply of blood than when in a state of apathy. The eyes become reddened with vascular turgidity during a paroxysm of crying, countless vessels appearing which were not seen before; and in an hour after the grief subsides the conjunctivæ become as pale as ever, no inflammation being provoked.

Ordinarily the cornea shows no vascularity, the vessels terminating in loops at its border, yet after an attack of purulent conjunctivitis, vessels are seen to traverse the entire diameters of that body. In such a case the extended vascularity is gained by the budding process, for vessels, as has been stated, did not exist in the cornea previous to the inflammatory invasion. The articular cartilages ordinarily exhibit no vessels, but numbers appear as soon as inflammation is established in these structures.

The *treatment* of inflammation consists in removing the cause when that still exists; and in the discreet use of antiphlogistics after the primary source of irritation is removed. When the inflammatory action is local, and the remainder of the body is uninfluenced by the disease, topical remedies alone may be sufficient. Evaporating lotions exert a cooling influence and favor *resolution* or a dispersion of the morbid states and conditions without suppuration. Among the agents in reputable use as evaporatives, are water, and diluted tinctures of arnica, aconite, opium, and hamamelis; camphor-water, as a topical application, lessens inflammatory action. When the heat is great, the pain acute, and arterial excitement high, the immediate presence of ice generally imparts a chilling influence that is favorable; so does the spray of an atomizer frequently impart a cooling effect that is not only agreeable to an inflamed part, but operates antiphlogistically. Pressure, as exerted in the strapping process in orchitis, is occasionally useful in the subjugation of inflammation. Heat is often to be utilized in the treatment of inflammation. It is generally easy and convenient to apply hot crockery plates to the chest and abdomen. The heat thus imparted to the bed and body may be great and lasting, especially if the plates be changed often, one being heated while another is in use. A hot brick or smoothing iron may be employed in the same way. Bags of hot salt and sand retain heat a long time, and may therefore be used to advantage in the management of inflammatory states. Fomentations of hops, and cloths wrung from hot water, are popular and efficient agencies in allaying certain phases of inflammation. The chief objection to them is that such applications soon cool, and they impart wetness to the patient's clothing and the bedding. Poultices have always been in popular favor as curative agents; and the relief imparted by them is often striking. The warmth and moisture relax the tissues and favor suppuration. The quantity of material employed should be abundant, so that the pultaceous mass may not dry into an irritating crust in a few hours. A poultice is rarely medicated; and one kind is about as good as another. Ground flax-seed is the common base of a simple poultice.

Irritating liniments provoke a glow in parts subjected to their influence, therefore they may be used at night when fires are out or in the summer. Blisters are employed as revulsives or counter-irritants, but occasions are rare when a morbid condition warrants the employment of such active measures. The "irritating plaster" has been considerably employed as a revulsive in the treatment of deep and chronic states of inflammation, yet the torture inflicted is generally too great to be endured with composure, and the benefit derived is rarely appreciable. At any rate, as much good can be derived from more endurable means.

Acupuncturation with croton oil, and other irritating substances, has taken a place among active derivatives, and may yet reach a higher plane as a curative agency. The moxa, which consists of punk, or a material which burns slowly, has been long in use among those surgeons who stand at the front of the heroic school. Baron Larrey was fond of charring the flesh of his patients; and he performed some wonderful cures.

Scorching the skin with a hot iron is still reputable in hospital practice, but the derivative is too severe and repulsive for impressible individuals. Spinal irritation and paralysis are the morbid states oftenest subjected to the revulsive influence of the actual cautery.

The local abstraction of blood by means of leeches, scarification and cupping, is presumed to be occasionally beneficial, but is so uncertain as a remedial agency, that the practice of taking blood has become obsolescent.

The remedies employed internally for the reduction of inflammatory fever are numerous and potent. In the early and active stages of systemic inflammation, the use of veratrum, aconite, and kindred agencies, is attended with marked success. A drop of the tincture of veratrum or aconite in a half ounce of water, constitutes a dose that may be repeated every two or three hours, when it is necessary to restrain an excited action of the heart, to avert rigors, relax the skin, promote a healthy secretion in the glandular system, and to restore the normal functions of the body.

When the breath is foul, the tongue covered with a brown coating, and the stomach is inactive, it is well to employ hydrochloric acid and quinia for a few days. A fermentative state of the stomach can usually be corrected by the use of salicylic acid. Pepsin aids a weak digestive state of the stomach.

A sedative is often exceedingly valuable in the management of diseases of an inflammatory character. In gun-shot injuries, and lesions attended with shock and followed by pain, large doses of chloral and morphia generally act in the happiest manner; and the greater the shock and the pain, the larger and more frequently repeated may be the doses, the rule being to stop administering sedatives and opiates as soon as the pain is mostly overcome. Opium often exerts a restraining influence over inflammatory action.

Cathartics were once employed as a means of lessening inflammatory action, and the results were frequently satisfactory, especially if the bowels happened to be in a loaded state. As most cathartics create more or less intestinal disturbance and some vital depression, it is often best to move the bowels by the assistance of an enema. However, there is generally little objection to the use of a cathartic at the commencement of an inflammatory fever, especially if the patient be vigorous, and the inflammatory attack has come on suddenly while the stomach and bowels are full.

Much experience and discretion are needed in the management of the diet of those undergoing inflammatory fever. It is often the case that too many kinds of food and drink are administered. Milk, gruel, and animal broth are the common dietary articles of the sick; and they should be taken as hot as the mouth and throat will permit. Ice-cream is palatable, refreshing, and generally digestible. Iced champagne is restorative in cases of pyæmia, and in exhausted states produced by suppuration.

Buttermilk is a refreshing drink, which contains some digestible nutriment. The juice of the best oranges is palatable, reviving and sustaining. Cordials made by stirring fruit jellies in water, are pleasant to the taste, and nutritious, but they readily ferment in the stomach unless a small quantity of salicylic acid be swallowed with them.

Beef-tea is one of the least objectionable and most stimulating of nutritive agents. It is made by cutting into thin pieces a half pound of lean meat, and steeping in a pint of boiling water for an hour, a little salt being added. At last the mess is to be boiled for fifteen minutes, and then squeezed in a muslin strainer until the juice is well extracted. Beef-tea is to be swallowed as hot as can be endured by the patient.

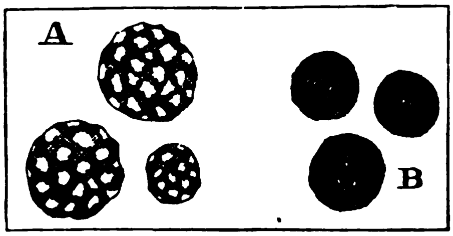
There is scarcely anything more nutritive and digestible than boiled pickled pork. A clear piece which has not been in the brine too long, is to be selected, and well boiled. Thin slices of this, after it is cold, are to be eaten with rye bread. The rind and lean parts are to be rejected. There is a senseless prejudice against pork as an article of diet. Thin slices of the fatty parts of boiled ham are digested with the greatest ease. Patients long in bed from the depressing effects of suppurative diseases must be nourished with skill, therefore the surgeon is not master of his profession unless he can dictate a proper dietary course for those under his care. In order to have food relished, it must be prepared and served with scrupulous attention. An invalid needs only a few articles of diet, but they must be so offered from day to day as not to provoke aversion and disgust.

ABSCESS.

An abscess has been defined as a circumscribed effusion of pus. When purulent fluid collects in a pleural, pericardial, or other serous sac, it is not an abscess. The cavity containing pus must have a layer of false membrane peculiar to itself in order to be an abscess. The softening of tuberculous matter in the lung produces a cavern or vomica, which has a ragged surface, and no lining membrane, therefore the collection of pus is not an abscess, strictly speaking, though possessing many of its features. An abscess may form in the pulmonary tissue, but it must have, as a lining to its cavity, a smooth membrane peculiar to abscesses in other parts of the body.

Pus is a common product of inflammation, and forms upon granulating surfaces as well as in the cavity of abscesses. It is generally yellowish white, and of creamy consistence; and is made up of serum, granular matter, oil globules, shreds of disorganized tissue, and pus-cells. The latter resemble the white corpuscles of the blood, and lymph-cells. If pus-cells be subjected to the influence of acetic acid they become transparent, so that a nucleus and a nucleolus, under a magnifying power of three hundred diameters, can be distinctly seen. Some cells have several nuclei, and each has a single nucleolus. Pus-cells are generated outside of the blood vessels, and are too large to enter the vascular system unless a vessel be ruptured. Pus-cells may decompose, and their *debris* then passes away by absorption. Purulent collections often disappear in this way; the serum is first absorbed, and then the pus-cells undergo granular disintegration, the absorptive process taking care of the residue.

FIG. 9.



A, pus-globules, magnified three hundred diameters. B, pus-cells rendered transparent by the action of acetic acid, so that nuclei and nucleoli are seen.

Pus forming in the cavity of an acute abscess, and where the reparative process exceeds the destructive action, is called *laudable*, to distinguish it from *sanious* and *ichorous* forms which spring from morbid processes that may be more destructive than reparative in their tendencies. Purulent fluid is not wholesome in appearance when curdy flakes float in a liquid having the consistence of whey. An abscess filled with a fluid of that nature may turn out favorably, yet the discharge is viewed with suspicion. "Chronic abscesses," or those forming slowly, under a low form of inflammatory action, and in patients suffering from anæmia, are apt to exhibit whey-like and curdy pus.

Puriform fluid in abscesses about the anus and in the labia, is often coffee colored and very fœtid; and gonorrhœal pus is sometimes greenish in hue; so is that which forms in the brain. Ordinary mucus has the appearance of pus; and a muco-purulent fluid can not be distinguished from either in a simple state.

Some purulent collections are so acrid that they stain the polished steel of the knife employed to evacuate them, yet the acridity may exert no erosive effect upon the surrounding organic structures. The admixture of decomposed blood may discolor pus, and render it acrid.

Pus has often associated with it the specific virus of the disease which during its progress develops purulency. The secretion of purulent ophthalmia conveyed by a handkerchief, napkin, or other vehicle, to a sound eye, will transfer the disease from one person to another; and gonorrhœal pus introduced upon the conjunctiva will infect that membrane. The pus of an erysipelatous abscess is contagious; so is that of a syphilitic bubo. Laudable pus injected into the veins of a healthy animal will develop delirium and lethargy, and sometimes destroy life.

Abscesses are usually divided by surgical writers into *acute* and *chronic* varieties, though the distinction in some instances can not be clearly drawn. The common type of the disease is acute, and chronic forms are exceptional. The progress of an acute abscess is as follows: An inflammatory swelling appears in some part of the body, with heat, redness and pain; after a season of increment a *pointing* occurs at the apex of the tumor, and a soft spot is the place where the pus, by a softening process, seeks escape by disorganizing the walls; and the evacuation of the pus is the termination of the affair, unless the healing of the cavity be reckoned as a part of the morbid action. As soon as suppuration takes place in the inflammatory tumor the pain lulls, and the patient sometimes experiences a rigor or "chill." The softening process inclines in the direction of least resistance, and at length *points* at the spot where the disorganized tissues are to tear and let the pent up fluid escape. The pointing of a pharyngeal abscess may take place in the mucous membrane of the throat, and not in the skin; an abscess of the liver may break into the peritoneal cavity, when it is fatal; or find escape through the diaphragm and lung, or reach the inside of the intestinal tube, or point in the skin after preparing a track through the abdominal walls. An abscess of the brain can not point, for there is no way for the pus to escape.

Some parts of the body are more subject to abscesses than others, though few textures are absolutely exempt from invasion. The glands are more liable to abscess than other textures; the tonsils are quite liable to abscess, and so are the mammary glands of females during lactation. The cervical region is prone to develop abscesses; and the axillary and inguinal regions, probably through the aggregation of lymphatic glands, are often the seat of abscess. Foreign bodies in the flesh, whether they be tubercular masses, sequestra, or missiles from without, are about sure to develop inflammatory and suppurative action, which can not well be distinguished from the formation and development of common abscess. A calculus forming in the pelvis of the kidney may develop an abscess in that region and point externally. A puncture made to evacuate the pus is not nephrotomy though a calculus escape by the opening.

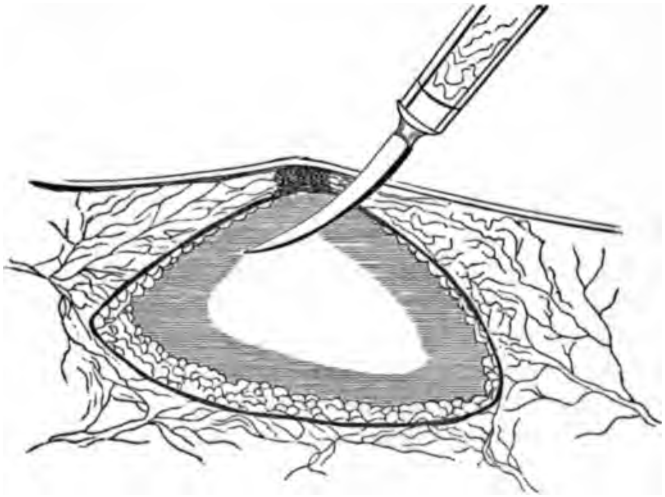
A slow forming abscess in a debilitated patient has been denominated *abces froid*, or cold abscess, though it is not different from what ordinarily passes as chronic abscess.

The cancellated and medullary structures of bones are liable to slow forming abscesses, though the nature of the tissues in which they develop has more to do with their tardy action, than any chronic character they may possess. Chronic abscesses appear in tuberculous and debilitated subjects; and oftenest invade the neck, the axillary region, and the loins and groins. A chronic abscess which bursts its thin walls, and scatters its contents into loose tissues, has been called a "diffuse abscess," though such a term is a contradiction, as the fluid is not "circumscribed" by a cyst-like wall. Pus is sometimes found in the tissues, no evidence of inflammation being present. In such cases the purulent fluid is thought to be produced by metastasis, inflammatory action suddenly subsiding in another place.

A nascent abscess may occasionally be aborted by the timely application of anodynes and cooling agents. However, it is not often that medical attention is directed to a phlegmon until the inflammatory action is too far advanced to be suppressed without suppuration taking place; and when purulency is inevitable the best plan is to hasten such a state. This is accomplished by the use of warmth and moisture in the form of poultices and fomentations. Cloths wrung from warm water will perform about the same office as a poultice, though the latter is generally approved. The prolonged action of warmth and moisture favors the maturity of the abscess, quiets the pain, and contributes to the pointing process.

A poultice may be made of ground flax-seed, pulverized slippery elm, corn meal, or any other unirritating material that will make a mushy mess. Bread and milk can generally be obtained without trouble, and answer a good purpose. Boiled onions, potatoes, carrots, and other vegetables will do. It has been presumed that slippery elm is superior to any other material for a poultice, but it puckers the cuticle, and is scarcely as emollient as flax-seed. The ignorant who have faith in that which is *outre* will often cast aside what the physician has prescribed, and apply the fresh ordure of the cow. And some physicians will persist in mixing lobelia, charcoal, or some other ingredient with the material which constitutes the chief part of the poultice, or they will sprinkle the surface which is laid upon the skin with laudanum, or some stimulating or relaxing liquid. An attempt to medicate a simple poultice will rarely accomplish what is designed of it.

FIG. 10.



Sharp pointed, curved bistoury used in opening an abscess.

After an abscess has reached or approached maturity, and there are substantial reasons for early evacuation of the pus, an opening may be made with a sharp pointed bistoury, the blade being straight or curved as the operator may fancy. The incision is to be large enough for a free discharge, and so made as to inflict as little pain as possible.

Many patients object to the use of a knife, preferring to wait until the softening process has made its own opening. There is no very weighty objection to this delay, except that of wasted time and expense. Often a layer of tough integument will resist voluntary evacuation for several days, during which time, if artificial evacuation be adopted as early as practicable, the cavity may have filled by the healing process.

An attempt to open an abscess is not commonly justifiable until fluctuation can be felt in the central region of the inflammatory tumor; and to be sure that fluctuation does exist, is not always an easy conclusion to reach. The experienced practitioner acquires what has been classically termed the *tactus eruditus*, or educated touch; but the sensation is sometimes so uncertain that no amount of experience can be relied upon. The beginner can educate his fingers by pressing upon the protuberances of a ripe tomato. The sensation thus obtained is quite like that received when manipulating the softened part of a mature and fluctuating abscess.

In cases of doubt in regard to the existence of pus, an estimate must be made as to the time the abscess has been forming, the grade of inflammatory action manifested, and the location of the morbid process. Where the nervous endowment is high and the vascularity great, the suppurative stage of an abscess is reached quicker than in a less highly organized part. However, the resistance offered by dense fascias and indurated textures, is to be considered. An abscess can not form rapidly in the medullary cavity or cancellated texture of a bone; and as a general thing the firm substance of a gland is opposed to rapid suppuration. A labial abscess may reach maturity in three days after any disorder in the part is first felt. The tissues are loose, and less resisting than in the finger where a felon may be ten days in forming. An abscess near the rectum forms hurriedly, and is very painful; and the quicker it forms the less likely is its cyst to degenerate into a fistula or sinus, the recovery being correspondingly rapid.

When two lymphatic glands in the groin have been inflamed, and the morbid action is subsiding, a soft and almost fluctuating spot is found between them which may be so deceptive as to lead to the mistake of incising the part. A slow forming abscess may tempt the surgeon to incise the lump before suppuration has commenced. Of course, nothing but blood escapes from the incision; and the patient may complain that a blunder has been committed or an experiment performed, but the self-possessed practitioner can claim that he was not altogether certain of finding pus, and that he has now divided the dense structures so that pus may escape as soon as formed. I once incised a very painful phlegmon on the front aspect of the wrist, and did not reach a purulent collection as I had reason to expect from the length of time consumed in the development of the abscess. The incision was half an inch in depth, yet no sign of pus could be detected with the free use of the probe in the bottom of the wound. The inflamed parts were treated with a poultice; and the following day a profuse discharge of pus came from the wound. If the incision had not been made the pus may have burst its cystic barrier and flowed along the sheaths of the tendons, to the hollow of the hand, and done irreparable harm.

It is sometimes prudent to explore suspected collections of pus with a needle made for that purpose. A chronic abscess of the neck, thorax, abdomen, and pelvis, often needs testing with an exploring needle before the evacuating knife is used. The best exploring apparatus is a long slender needle encased in a silver sheath, like the canula which goes with a trocar. After the point is forced into the purulent cavity, the needle is withdrawn, when a drop of pus, if present, will escape from the canula. A grooved needle, such as is found in the ordinary pocket case of instruments, may do to make an exploration, yet it is not as good as the apparatus just described.

Much has been said by surgical writers about evacuating chronic abscesses and purulent collections through a valvular opening in the instrument, or with an aspirator—an instrument which takes out the pus and does not admit air to supply the place of the fluid evacuated. This is all very plausible in theory, but defective in practice. I contend that the surgeon can not keep air out of the purulent cavity if he would, and that he should not do so if he could. A chronic abscess needs freely incising in various directions to get rid of pockets containing pus, and to make room for local applications to the pyogenic surfaces. An acute abscess needs little treatment after its purulent contents are discharged, but the cavity of a chronic abscess should have the fluid extract of Pinus Canadensis freely applied to it for several days, or until the healing processes are established. Carbolic acid is also a good application. Chronic, strumous, and "cold abscesses" occur in debilitated and wasted patients, and are consequently attended with irritative fever and signs of blood poisoning or septicæmia. The pulse becomes rapid and weak, the tongue coated, the skin hot and dry, with thirst, loss of appetite, and rigors. Great weakness is a concomitant, as well as restlessness; and sometimes the patient wears out with diarrhœa, colliquative sweats, and paroxysms of hectic. To overcome these prostrating conditions, mineral acid and quinia should be administered, also champagne and ice cream. A favorite prescription is the following:

℞ Peppermint Water, f℥ii.
Sulphate of Quinia, grs. vi.
Hydrochloric Acid, gtt. iv. M.

Dose, teaspoonful every two hours.

Milk, gruel, soups, and other easily digested and nutritious aliments are to be given, but always with regard to the age and general conditions of the patient. Different persons often require different management as regards both food and medicine; and morbid conditions seemingly the same may vary exceedingly without being discoverable.

A persistent and exhaustive diarrhœa attendant upon purulent collections, can generally be controlled by a liberal administration of the fluid extract of logwood. It is still a mooted question whether a strumous abscess should be opened early, or allowed to burst and discharge voluntarily after the patient's health has been recuperated as much as possible. While I advocate attempts to restore the accustomed constitutional vigor by all well known means, I rarely see any substantial reason why an evacuation of the purulent collection should be postponed. To obviate unpleasant collapse it may be well to try stimulants and nutrients a day or two before evacuating the pus. It is also a question whether all the pus should be allowed or be made to escape at once, or, by stopping the hole, permit only a part to flow at any one time. I think as a general rule, a free evacuation should be permitted or secured by moderate pressure, and that large collections should not be allowed afterwards. A pool of decomposing pus can serve no useful purpose.

Abscesses in different parts of the body may need some special directions for their management. An abscess of the eyelid, commonly erysipelatous, should, while forming, be covered with a wet compress. A poultice may undergo fermentation and inflict damage upon the cornea or conjunctiva. And when the abscess is mature or ready to be evacuated, the incision should be made in the direction of the course of the orbicularis palpebrarum muscle. In fact, all incisions for the evacuation of abscesses should be made in the direction the muscular fibres take at the spot where the knife is used. However, the course of ducts, important nerves, and blood vessels, is to be considered. While incising an abscess of the cheek, the parotid duct should not be endangered, nor the facial artery and vein. An abscess of the tonsil is to be incised by wrapping the blade of a straight bistoury with adhesive plaster to within a third of an inch of the point, and then plunging the exposed point into the fluctuating part of the swelling. The wrapping prevents the knife from cutting the lips and tongue. There is little danger that the point of the bistoury will transfix the external and deep walls of the abscess, and puncture the internal carotid artery, for the swelling is wholly in the fauces, the covering of the purulent cavity being far removed from the vessel named. Abscesses of the neck, especially if they be deep in the cervical structures, should be opened with great circumspection, as the region is packed with important nerves and blood vessels. In some instances it might be best to incise layer after layer of tissue, the grooved director being used to reveal the parts about to undergo division. The merest puncture of the largest vessels might prove disastrous. The opening of a superficial axillary abscess is not attended with danger, for the swelling carries the external covering of the purulent cavity to a distance from the nerves and vessels behind the tumor; but a deep abscess of the axilla reaches beyond the plexuses of vessels and nerves, and should therefore be incised with extreme caution. After an incision large enough to admit the finger is made, the external wall may be drawn away from the vessels, and then freely incised without danger. Abscesses of the hand are to be evacuated with care lest nerves, vessels and tendons be injured. A mammary abscess arising from secretory excitement which follows parturition, is often very troublesome before the morbid action ceases. While a "milk abscess," so called, is forming, the inflammatory tumor should be poulticed until suppuration is established; then the bistoury may be used to evacuate the pus. If milk escapes with the purulent fluid it does not necessarily indicate that a lactiferous conduit has been divided with the knife, for the disorganizing effect of the softening process may have opened several milk ducts. Mammary abscesses are sometimes of a strumous or chronic nature, especially when they occur in scrofulous subjects, hence they are attended with great prostration of the vital powers, and irritative fever. It is sometimes amazing to observe how rapidly a young female, lately blooming with health, will sink under the influence of a milk abscess. A roundness of feature, flush of color, and vivacity of spirits suddenly give place to a pinched countenance, pallor of cheek, and mental depression, which are truly appalling. Such a patient needs comfortable surroundings and supporting treatment. Iron, quinine, beef tea, ice-cream, cordials, fruit jellies, oyster broth, and such dainties as tempt the appetite and invite digestion are to be used. But such a patient is often the wife of a poor man who can not afford luxuries, and the invalid is distressed in mind through regret at being a pecuniary burden to her husband.

Frequently one mammary abscess after another will form during the period of lactation; and the patient may have to wean her child to escape fatal consequences. Sinuses occasionally form, and fistulous tracks reach from the opening in the skin to the suppurating cavity, the distance being an inch or more. Pressure brought to bear with strips of adhesive plaster, is perhaps the best means of destroying the purulent canals. A chill, with pains in the muscles and bones, commonly attends the development of a mammary abscess.

Among the more dangerous of abscesses are those which form in the viscera of the abdomen, for, if they burst into the peritoneal cavity, the issue is fatal. Generally the pointing of the abscess will be into the intestinal tube, adhesion and softening between a knuckle of intestine and the tumor having first occurred; or the walls of the abscess unite with the walls of the abdomen, and the softening process favors a discharge through the skin. Incipient abscesses of the liver, cœcum, or other viscus, are to be invited to the surface of the abdomen by the free use of poultices; and if it be possible to detect the place where the pus is likely to find its way out, an incision in the skin, fascias, and outer layers of the abdominal muscles or aponeuroses, will hasten and direct the purulent exit. An exploring needle may be forced deeper than the incision extends, which also invites a course for the escape of the pus.

A psoas abscess forms in the lumbar region, and the pus usually follows the sheath of the psoas magnus muscle to a point on the [illegible] The abscess has [illegible] lumbar vertebræ near [illegible] of gravity the pus [illegible] loose covering of the [illegible] in that direction. [illegible] the muscle at the lesser [illegible] to the surface, or makes [illegible] descends to a point just [illegible] progress being stoutly resisted [illegible] purulency opens a way of [illegible] that point, and comes to the [illegible] abscess does not follow the [illegible] a track to the surface in [illegible] crest of the ilium. Psoas [illegible] dangerous in their nature. Their [illegible] the abdomen, or in connection [illegible] of the vertebral chain, it is [illegible] disturbance attendant upon [illegible] disease should be very grave. [illegible] fluid is by a long track which [illegible] the production of pus is so pro- [illegible] exhaustive.

[illegible] abscesses is chiefly constitutional, its [illegible] patient until the suppurative action [illegible] that the reparative action may close [illegible] degeneration and suppuration. Recove- [illegible] months and even years of waste and [illegible] remedies of an active nature can be made [illegible] disease. How improbable it is that a [illegible] wash can be made to reach a spot so [illegible] where the syringe is introduced, yet I have [illegible] to be made with the assurance that the [illegible] through the sinuous track until the ulcera- [illegible] lumbar region were reached!

[illegible] the hip-joint commonly arise from articular [illegible] psoas or lumbar variety, they depend more [illegible] and are perplexingly protracted in their [illegible] there is a spontaneous cure, but in more [illegible] disorganization of the joint. In not a few [illegible] suffering, and exhaustive wastes, necessitate

Lymphatic abscesses in the groin, when of venereal origin, called buboes, are not substantially different from abscesses in other parts of the body. They are to be poulticed until they are mature, and then evacuated by the aid of a bistoury. To open an abscess with potassa fusa is a barbarous and unsatisfactory plan.

Abscesses about the floor of the pelvis may come from urinary infiltration, and are to be evacuated, and subsequently treated by perineal incisions to cure the fistulous tracks.

Abscesses about the anus are apt to degenerate into fistulæ in ano, and dissecting sinuses about the rectum. Tuberculosis being the common cause of abscesses in this region, local treatment may not be sufficient to obtain permanent cures, therefore constitutional measures should be adopted early, and kept up for a long period.

Abscesses of the joints are to be treated in their forming stages with cold and anodynes; and in their advanced states with poultices or fomentations, and in mature forms by incisions. It has been a maxim in surgery that the articular surfaces must not be exposed by incisions made to evacuate purulent fluids, but the let-alone practice is no longer heeded. An abscess of the joint should be evacuated as soon as the indications are plain; indeed, it is safer to open the joint than to allow pus to remain there, and the process of disorganization to go on.

An abscess of the foot is to be treated like the same disease in the hand. It is to be poulticed until suppuration is established, then evacuated by free incision, care being exercised in the operation that nerves, vessels, and tendons, escape division or other injury.

BOIL (FURUNCULUS.)

The skin and subcutaneus areolar tissue is subject to the development of a specific phlegmon, or highly inflamed tumor, which suppurates in its center, and discharges a core. A boil is rather slow of growth, considering the vital activity displayed in its evolutions; and it is exceedingly painful. While developing it stiffens the muscles and mobile parts in its vicinity. "As sore as a boil," is the comparison made to indicate a painful state of great intensity.

The disease is so common that almost every individual is familiar with its features and phases. A pimple is the first morbid manifestation noticed; and in the course of two or three days, this reaches the size of a pea. At this period it may suppurate and subside, but if it be of the larger variety, it will continue developing until it is as large as half a hen's egg. Two or three small boils may appear in the vicinity of the large one, and contribute not a little to the general discomfort. In fact, it is thought that a state of blood has something to do with the appearance of a crop of boils; and the cause is often attributed to violent exercise, over-heating, and other causes more or less whimsical.

A small pustule usually forms on the apex of a large boil; but the drop or so of pus it contains does not indicate that the boil is ripe, or that the great central slough, which is deeper, has softened sufficiently to escape, even if a large incision be made for its exit. Generally it is better to let the pustule alone, and only open the great central cavity beneath, when the tactile sense in the finger determines by the fluctuation that pus exists.

The people are prone to say that boils are "healthy," yet it is probable that they are local manifestations of systemic conditions morbid in character. The dieting and physicking a patient may undergo while a victim to the development of a series of boils, may do him some good, but the value of such renovation is questionable.

Boils do not locate themselves on all parts of the body alike, and what is seemingly singular, they appear oftenest on the forehead where the hat presses, or on the shoulder where the suspenders rest, or on the nates in places rendering it inconvenient to take a seat. Probably the reason these parts are most frequently afflicted is that the fretting the integument undergoes leads to the localization of boil-poison which lurks in the blood.

Revolutionary changes in the fluids of the body, such as take place in fevers, and exhaustive diseases, and during periods of recovery, a large amount of new material being returned to the organism, tend to the formation of boils.

The treatment of boils is chiefly local, though there is occasionally some benefit derived from constitutional remedies that exert a sustaining influence. Quinia, mineral acid, bicarbonate of soda, and salicylic acid, have been administered as prophylactics when a series of boils appeared, and as tonics and alteratives when a large boil is going through with its various evolutions.

An old-fashioned remedy for boils is a combination of soap and sugar, locally applied. Although the soap would be somewhat irritating at first, the ultimate effect would be that of a poultice. Another popular remedy is shoemaker's wax, but the agent has few qualities to commend it.

Sometimes a boil can be aborted during the earlier stages of its development, by the use of the extract of belladonna, or by the constant application of the tincture of aconite. Probably the abortive force, if any exists, resides in the sedative qualities of the agents. Local anæsthesia, by means of spray or ice would tend to abort an incipient boil.

The best treatment for a boil is to subject it, like any other abscess, to the influence of poultices, until suppuration takes place, and then incise it freely, that the pus, slough, and debris, may find exit. It is not proper to squeeze a boil too severely, to hasten evacuation of its contents. After a boil is ripe, and it has been incised, the place of exit for the pus is kept established by the moisture of a poultice.

CARBUNCLE.

A carbuncle is a compound boil, and discharges through several apertures. It is deeper, larger, less conical on its surface, and not so well defined as a boil. Carbuncle is a graver disease than boil, death not being a rare sequence of the morbid processes. Men are more liable to the disease than women ; and the neck and back are oftener the seat of the morbid action than the front side of the body.

Anthrax, for this is another name for carbuncle, rarely attacks a person under twenty years of age ; and is as prone to appear in generous livers as in the poor and spare. An individual with feeble digestion, sallow complexion, and a depressed or worried state of the mental faculties, may possess what has been denominated the carbuncular diathesis, and be subject to a return of the disease every year or two. Persons subject to gout are thought to be predisposed to carbuncle, yet an association or relation of the two diseases is not clear.

Missionaries and those who have lived in half civilized countries affirm that what is called "malignant carbuncle" prevails among those who feed upon diseased meat. At any rate, carbuncle is very fatal in hot climates.

I have met with carbuncle on the lip, the front of the thorax, the sides of the abdomen, the nates, and the front and outer aspects of the thighs, but I have treated more upon the back of the neck than upon all other parts of the body.

Two carbuncles rarely appear at once, but one may succeed another until several have presented themselves in a period of six months.

Carbuncle begins in a painful inflammatory swelling which gains in depth and area from day to day, until a tumor the size of a small biscuit is attained. While the morbid growth is forming, the patient experiences chilly turns, fever, anxiety, and considerable prostration. The tissues in the vicinity of the carbuncle become infiltrated with lymph and serum, so that the parts appear œdematous. The soreness is intense, and the pain in the region is so great that all movements which aggravate the suffering are scrupulously avoided.

The thick skin, dense fascias, and tough tissues in the back of the neck resist the softening and suppurating processes, so that the evolutions of a carbuncle are discouragingly tedious.

A patient, during the forming stages of carbuncle, needs sustaining treatment. He may require an anodyne at night during the most painful period of the disease; and mineral acid and quinia during the day. Salicylic acid in grain doses, repeated every six hours, may be administered to advantage while the breath is fœtid and the stomach is foul.

Locally a poultice, such as would be employed in the local management of a boil, may be kept upon the carbuncle for days and even weeks, the mass being generous in size, to prevent drying, and often renewed to obviate fermentation. As soon as the carbuncular swelling begins to soften in spots, the knife may be used to evacuate the accumulated fluids, and to take off the strain from tense tissues. In the course of time in the progress of the softening processes, the spaces between the purulent cavities may be divided. A free division of the dense structures facilitates the discharge of the sloughs or complex cores. It is idle to think a carbuncle can be aborted, or brought to a successful issue by an expectant plan of treatment. Heroic incisions after the disease approaches maturity, hasten the curative process. After several apertures have formed on the surface of a carbuncle, a small amount of salicylic acid should be daily sprinkled upon the suppurating parts. This obviates fermentation and septicæmic poisoning.

It has been recommended by eminent surgeons, that potassa fusa, or other powerful escharotic, be placed in the center of a carbuncular swelling, with the expectation that the charring process will hasten the maturity of the disease, and provoke early reparative action. If any kind be used, with such objects in view as have just been named, carbolic acid, of full strength, is the best agent for the purpose.

It has been the custom of surgeons to make a crucial incision in a suppurating carbuncle, to afford an opening for the escape of a slough. This operative procedure is good, but I do not hesitate to make several cross cuts to considerable depth. The bleeding is insignificant, and the pain is not greater than when a light and insufficient incision is made.

SINUS AND FISTULA.

An abscess has a tendency to degenerate into a long, narrow, suppurating canal which exhibits little disposition to heal, unless attacked with caustics or subjected to pressure. Unnatural apertures leading from a gland that has its duct obliterated or obstructed, and accidental communications between canals or cavities, partake of the character of sinuses, yet they are commonly denominated fistulas. Suppurating tracks leading from collapsed abscesses in the mammary gland, may legitimately be called sinuses, as well as those purulent canals that discharge pus from a carious or necrosed bone. It has been claimed by surgical writers that the distinction between a fistula and a sinus is that the former has *two* openings, and the latter but *one;* but the difference is not thus well expressed. Large openings between the bladder and vagina are spoken of as vesico-vaginal fistulæ, but under other circumstances a fistula is of small calibre and considerable length. A sinus may have any length and any size, but it is oftener large than small.

The walls of sinuses are usually indurated, yet neither vascular nor sensitive, especially if of long continuance. When the outlet gets obstructed, and an inflammatory action which is acute comes on, the walls of a sinus may become exquisitely sensitive, and bleed upon the slightest touch. A chronic sinus is apt to have a lining that is smooth, shining, and moist, like a mucous canal.

If this track be irritated, a reparative action is called forth, but the granulations are pale, flabby, and not disposed to form healthy tissue. The work of repair may be regarded as hopeful when laudable pus is thrown off, and as useless when the purulent discharge is thin, turbid and flocculent.

I have examined sinuses in the gluteal and perineal regions that were fifteen inches in length, and large enough to admit the finger in places. Extensive fistulous or sinuous tracks are not easily cured; and occasionally they result fatally. Miss J. G., twenty years of age, died of lumbar, gluteal, and ischeal sinuses. Autopsy revealed burrowing and branching sinuses which would make a single canal over six feet in length. The several openings in the skin discharged more than a quart of pus a day for several weeks. The *post-mortem* examination was made to ascertain if any of the pelvic bones were diseased, but no sinus penetrated the periosteum. One branch communicated with the rectum, yet this was regarded as one of the later complications of the disease.

Sinuses are frequently curable, yet the cause of the morbid condition must be discovered, if possible, before an attempt is made to establish a curative action. I once slit open a sinus on the cheek, presuming it had its origin in a diseased lymphatic gland; the daily application of iodine was ordered to be applied to the wound, but after three weeks' treatment and a closure of nine-tenths of the track, a small pouch-like cavity refused to heal, and poured forth as much pus as the original sinus; this led to a more careful and searching exploration on my part, and I discovered that a fistulous canal, angular and tortuous, led to the vicinity of the last molar tooth of the lower jaw. I presumed a fang was in a state of ulceration, and that the adjacent osseous structure in a state of decay, furnished the purulency of the sinus. Extraction of the tooth was soon followed by a voluntary healing of the sinus.

In the event that sinuses spring from caries and necrosis, it is rare that a cure can be effected without removing the dead bone. Cures have been effected in rare instances by injecting the sinuous tracks with sulphuric and carbolic acid. Sinuses leading from glandular structures may be cured by pressure when such a force can be applied, and by the injection of caustic fluids. It is sometimes beneficial in the treatment, to dilate the sinuses with sponge tents. After free dilatation, a small swab may be used instead of a syringe. The compound tincture of iodine is an excellent stimulant and astringent to inject into fistulas and sinuses.

If an efficient caustic be needed to break up the calloused walls of an old sinus, there is nothing better than chloride of zinc for the purpose. This may be made into a thin paste or strong solution, and applied with a probe, swab, or glass syringe. The action of the caustic produces considerable pain, which is quite prolonged, but not as acute as that excited by the quicker acting escharotics.

After the morbid structure is disorganized, its place is filled with granulations and sound tissues, if no cause remain for the reproduction of ulcerative action. But if one sinus after another succeeds a seeming cure, there is reason to search for a hidden cause. Not unfrequently it is impossible to cure a complicated sinus. If a constitutional taint of a venereal or scrofulous character be in the way of a cure, a thorough course of medication may lead to a successful issue.

The presence of a foreign body in the flesh is a common cause of obstinate sinus; and if the substance provoking the discharge be not suspected, the case may be very perplexing. I once made a deep incision into the heel and plantar fascias to discover the cause of a suppurating sinus or fistula which had existed for four years. I cut upon and removed a fragment of a clay pipe. At the time the foreign body reached its hiding place, the boy received several wounds of the foot, and all healed in a few days, except the one made by the piece of earthen ware. The sinus leading to this would heal and remain closed for weeks together, but was sure to show itself again and again, until the cause was removed.

ULCERATION AND ULCERS.

Ulceration is the destruction of tissue in particles under the influence of inflammatory action, the waste material being mixed with pus. An ulcer is the open sore produced by the ulcerative process; and has been defined as a solution of continuity in the hard or soft structures, accompanied by a discharge of pus, ichor or sanies.

The molecular death attending ulceration is practically the same as that which takes place more rapidly, producing defunct masses visible to the naked eye, and called sloughs. When organic structures die altogether, neither ulceration nor sloughing defines the morbid operation, but gangrene is the term to be used.

It is not often that ulceration will attack tissues which are in a vigorous state of health, but it is inclined to invade textures which have suffered previous inflammatory action, and become vitally defective through enfeebled circulation and faulty nutrition. An ordinary wound may be followed by an ulcer, yet the accompanying inflammation is attended with vital energy, and the result is reparative; but an abrasion of a leg which is already purple with venous congestion, is often the beginning of a low form of inflammatory action which is destructive in its tendencies, more organic material being liquefied and lost, than is gained by recuperative efforts. Ulceration may go on in one part of an ulcer, while granulation and reproduction take place in another part of the sore. The purulency coming from an ulcer undergoing degeneration is ichorous and foul; and pus arising from a healing sore is said to be "laudable."

Ulceration may be so gradual as to be scarcely perceptible, or it may become phagedenic, destroying textures with frightful rapidity. But the healing process is always slow; and the more hasty the destructive influence the more tardy the recovery. The speed of the ulcerative process does not depend upon the condition of the tissue attacked, but upon some specific poison in the ulcer.

The nomenclature of ulcers generally adopted calls for too many varieties to serve any practical purpose. In Miller's *Principles of Surgery,* ulcers are divided into the "simple," the "weak," the "scrofulous," the "indolent," the "mucous," the "irritable," the "inflamed," the "sloughing," the "phagedenic," the "sloughing phagedenic," and the "varicose," to say nothing of the vicarious, the malignant and the specific, which form special topics of pathological investigation. Many of the characters indicated in this division are temporary, accidental, or common to two or more varieties, therefore such a nomenclature is unscientific, and fraught with confusion.

A *simple ulcer* is the type by which to compare or contrast varieties; it follows the separation of a slough attendant upon a bruise or injury in a healthy subject. The edges of the sore shelve gently down to the base; granulations spring from the open surface; laudable pus bathes the granulations; and the skin around the ulcer is increased in vascularity and sensibility. Such an ulcer heals rapidly without any kind of treatment being useful, unless it be a covering of adhesive plaster to shield the delicate granulations from irritation or injury.

Patients sometimes complain that every little abrasion they receive, runs into an ulcerative state which spreads considerably and heals slowly; and they will assign as a reason of this that their blood is bad. Now, an ulcer of that kind belongs to the simple variety, but does not conform strictly to the type. It may indicate a condition of body, or dyscrasia, which would be benefited by the use of mineral acid and quinine, and an occasional dose of sulphur. And the foulness of the ulcer may be improved by the topical use of carbolic acid.

An *eczematous* ulcer is one in which an eruption upon the leg, for instance, is scratched and worried into an ichorous and suppurative state. There may not be a well defined ulcer to deal with, but ulcerative patches which were vesicles at first, then minute ulcers. Considerable inflammation attends such a state of the limb, and great discomfort from itching, and ichorous discharges which dry and form crusts. The disease may appear in the plethoric and well-fed, especially late in life, but is oftenest met in the ill-fed, the overworked, and the enfeebled from excessive drink.

The treatment for eczema will commonly cure the vesicular and ulcerative state, especially if the limb be bandaged from the toes to the knee. An ounce of "cold cream" having a fluid drachm of Fowler's Solution incorporated with it, makes an efficient and agreeable unguent to apply to the ulcerated patches. A light dressing of Mayer's ointment may do, but the following combination is better:

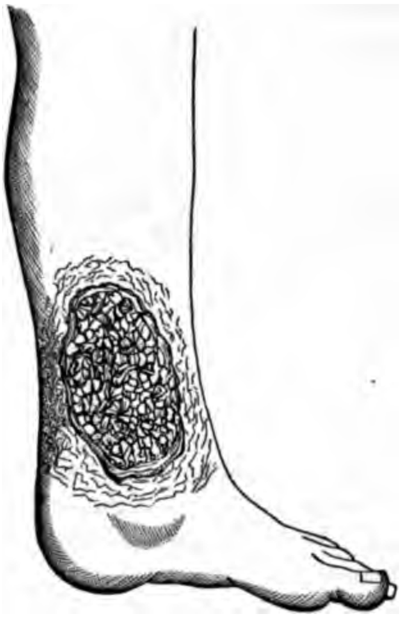
℞ Simple cerate, ℥iss.
Citrine oint., ℥ss.
Pulv. sub-nitrate of bismuth, ʒi. M.
Scent well with the oil of bitter almonds.

This ointment is excellent in the treatment of any kind of eczema, whether as ring-worm, scald head, or salt rheum. Internal remedies are not always necessary, though a good state of the stomach and bowels is desirable.

A *strumous* ulcer forms in tuberculous and scrofulous patients, and attacks any part of the body. The ulceration follows the evacuation of tuberculous, phlegmonous and scrofulous abscesses, which are prone to form in the neck and groin, but are met in other regions of the body. The scalp of scrofulous children is especially liable to suppurative lumps which degenerate into strumous ulcers.

The local treatment consists in cauterizing the ulcers with carbolic acid, then dressing with Mayer's ointment. As the edges of the ulcer are often undermined, and a cheesy mass occupies the cavity, a pencil of wood should be used to introduce the caustic to the depths of pockets where a careless or superficial application would not reach. The constitutional management is the most important, and consists in the prolonged use of tonics and alteratives. Cod liver oil is a valuable remedy, but it is offensive to the smell and taste. The iodides of ammonium and potassium are excellent alteratives, and sulphur exerts a beneficial influence in tuberculous cases. The acid solution of iron, which is made by dissolving two parts by weight of sulphate of iron in one part of nitric acid and ten parts of water, and then filtering, is a favorite remedy in the treatment of scrofulous subjects. Three or four drops of the mixture put into a half wine glass of water, constitute a dose, which may be repeated every three or

FIG. 11.



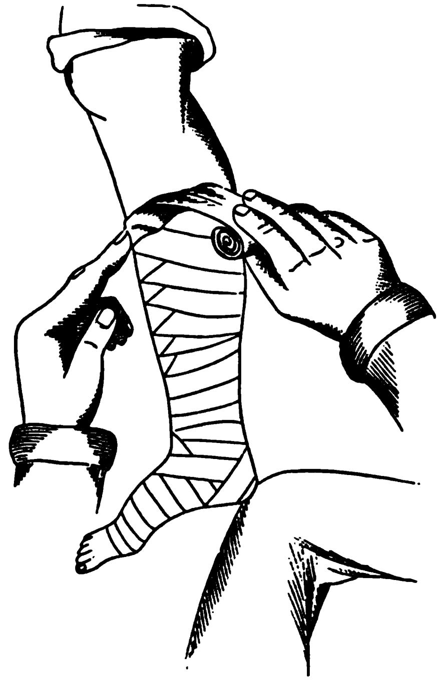
Indolent or chronic ulcer.

four hours. The cicatrices following the healing of strumous ulcers, are usually puckered and unsightly.

A *chronic, indolent,* or *callous* ulcer, for all these names may be applied to one variety of sore, commonly forms on the leg; and is the result of a debilitated constitution. The limb is usually œdematous from the toes to the knee, and especially in the vicinity of the ankle. The circulation in the swollen tissues is feeble, and the capillary veins are dilated. The œdema arises from defective vascularity, and aggravates the circulatory disorder. The edges of the ulcer are indurated and not shelving or undermined, but they gradually descend to the bottom of the excavation which is smeared with ill-conditioned pus. The ulceration dissolves and ejects the integument, superficial fascia, and adipose tissue, but rarely penetrates the deep fascia which envelopes the muscles. The skin around the ulcer is discolored and thickened; a few feeble granulations may be visible in the bottom of the sore, especially when the reparative action asserts its utmost powers; and a very disagreeable smell comes from the limb. The ulcer is not particularly painful, except when subjected to prolonged irritation. Indolent ulcers are common among the inmates of hospitals and eleemosynary institutions; they are the result of poor living, exposure, sickness, excessive drink, lack of cleanliness and timely medical attention.

The treatment of a chronic ulcer is chiefly through mechanical pressure which can be exerted by a properly applied bandage. The sore may be covered with a piece of lint, spread with Mayer's ointment; and then the leg is to be wrapped with a bandage torn from a firm and fine piece of flannel. The material is elastic, and, being chiefly of wool, will not slide and gather into folds like linen or cotton fabrics. The bandage should be all in one strip, though two or three joinings will not do much harm. It should be five or six yards long, and made into a snug roller before application. Two bandages are required for the treatment of a limb; while one bandage is in use, the other is to be washed and ironed. A bandage is not fit for application the second time until it has been re-washed, for the conical shape of the leg stretches one edge more than the other, imparting a "bias" to the fabric. The leg should have a fresh dressing every day. The bandage is applied by beginning to wrap the foot just back of the toes, two or three turns being taken to secure the end of the strip; and as the bandaging goes on, diagonal turns should be carried around the ankle, then back to the hollow of the foot and over the instep, care being exercised to snugly compress the soft spaces beneath the malleoli, and to leave the point of the heel exposed. After a considerable portion of the bandage has been expended upon the foot and ankle, some parts receiving two or three layers, the wrapping continues up the limb, covering in the ulcer or ulcers as it proceeds, until the envelope reaches above the calf; then the remainder of the roller is to be used in downward turns over the first covering, until the bandage is spent. It is all the better if the leg gets a double envelope in this way. The bandage being elastic, and the leg only slightly conical on account of the swelling above the ankle, the usual "reverse" made while dressing a limb with the linen or cotton roller, is not necessary; but the spiral turns are executed by giving some obliquity to them.

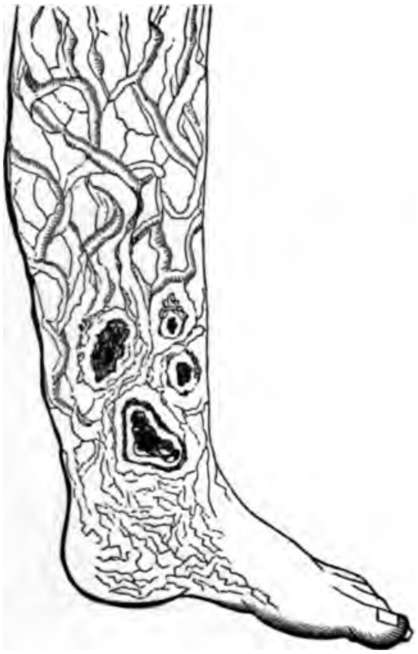
FIG. 12.



The application of the spiral "reverse" bandage.

A *varicose ulcer* is chronic, indolent, and often has a calloused border, but it is so called because the ulceration depends upon a dilated or varicose condition of the veins. If a leg has been broken, or has suffered a severe injury, so that cicatrices exist in the integument of the limb, the veins are apt to become dilated, pouched and tortuous. The superficial veins of the leg generally become more or less varicose by the time middle life is reached; and some families are more liable to the defect than others. Not only are the larger veins dilated, but the varicose condition extends to the capillary vessels about the foot and ankle. In the soft spaces beneath the malleoli clusters of tortuous and convoluted veins may often be seen, while higher up the leg venous pouches may be observed. Sometimes a dilated state of the superficial veins extends the whole length of the limb, and even to the scrotum and abdomen. But varicose ulcers rarely form except on the leg not far from the ankle. The varicosity above, though very conspicuous or pronounced, seldom results in ulceration.

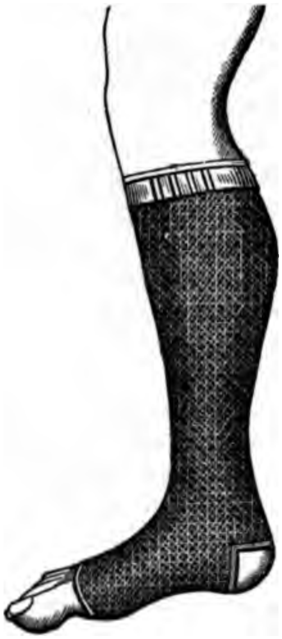
FIG. 13.



Varicose ulcer.

A varicose state of the veins in the leg leads to œdema, and a thickening of the tissues which favors eczematous manifestations and low forms of inflammatory action. A person may have such a limb for years without any considerable discomfort, when from the bite of an insect or a scratch of the finger nail, the leg will itch, burn, and become suddenly sensitive, as if an onset of erysipelas were impending. In a day or two there is absolute soreness in the limb, and a paroxysm of acute inflammation seems to be developed. Now, if the patient is indiscreet enough to bathe the limb in warm water or apply a poultice to it, an ulcerative action is favored, and in a few days unwelcome ulcers are established. After the ulcerative action is initiated, the inflammation may subside, so that the limb becomes quite comforta ble, yet an ulcer once established in a varicose limb will rarely heal of itself and not return. As years pass by, the morbid condition grows worse, and the ulcer, having constituted a drain or issue which is habitual, will not heal without methodical pressure is brought to bear upon the limb. The inexperienced practitioner may think that a powerfully "healing salve" may prove all that

FIG. 14.



Elastic stocking.

is necessary to effect a cure, but a few obstinate cases will disabuse his mind of such fallacies.

The treatment of varicose ulcers is not different from that advised for the cure of chronic ulcers. The limb is to be compressed with a good flannel bandage, Mayer's ointment being first applied to the sore. In the application of the bandage the pressure must be greater about the foot and ankle than above the sore. Thus graduated the superficial veins are kept empty. And in the management of the case the practitioner must not give the unguent much credit for curative properties, but consider the advantages of a well applied bandage. A patient can be instructed in regard to the application and use of a bandage, so that he can apply it skillfully himself; but if he is allowed to believe that the salve performs the cure he will neglect the daily application of a fresh bandage, and the ulcer, though far advanced in the healing process under good treatment, will soon relapse into its former state. If an unpleasant smell arises from a chronic or varicose ulcer, the surface of the sore may be daily sprinkled with salicylic acid.

Constitutional treatment of an alterative and tonic character is not out of place in the management of chronic or varicose ulcers. The general organism is usually debilitated, therefore nutritious food, iron, mineral acid, quinia, iodine, sulphur, and, if the heart be diseased, veratrum, constitute agencies which may be administered advantageously.

After the ulcers have healed the local compression can not be safely laid aside, but the bandage may be exchanged for an elastic stocking. This is to be worn for years, or until there be no longer a tendency in the leg to swell. The cotton elastic stocking is better than silk. It costs less, and, if a thread breaks, is not so likely to ravel. The stocking should be small enough to exert considerable pressure. An ordinary sized leg would require a number four or five, and a large limb might need a number six or seven.

When troublesome varicose veins extend to the body, a stocking long enough to reach to the groin may be worn; and a medium length, to reach just above the knee, is desirable when the veins in the popliteal space need compressing.

The transplantation of minute pieces of healthy skin to the surface of large ulcers, which, from their size, will not heal under ordinary treatment, has resulted in establishing centers of tegumentary growth, and in the complete restoration of a cutaneous covering. The process of cure is described under the head of *skin grafting.* Unless the granulations be in a wholesome or reparative condition, the grafts will speedily perish. In unpromising cases of the kind it may be best to perform a dermo-plastic operation, which can be successfully accomplished by dissecting an elongated flap of integument from the adjacent skin, a pedicle near the border of the ulcer being left for the purpose of receiving vascular supplies, and twisting it into the chasm with the expectation that its under side will adhere to the surface of the ulcer. When a large ulcer exists behind the ankle there is not a good opportunity to bandage the limb without irritating the sore, therefore it is best in such a case to take a flap from the integument on the posterior aspect of the leg, just above the ulcer, and turn it down over the tendo-Achillis, as a basis for lateral tegumentary growth.

Irritable, inflamed, and *hemorrhagic ulcers* of the leg are accidental conditions of ulcerative disease, and not distinct varieties; and are to be managed according to existing indications. An occasional hemorrhage depends upon the rupture of a small vessel, or the laceration of tender granulations; an irritable and inflamed state is readily overcome by a few days rest, with the limb somewhat elevated.

Phagedenic and *sloughing* ulcers may need cauterizing with carbolic acid or chloride of zinc, to arrest the rapidly destructive process.

Exuberant ulcers are those which exhibit an excess of granulations, and need touching a few times with a sulphate of copper crayon, or other escharotic.

Lupous, cancerous, syphilitic, and specific ulcers will receive attention in another place.

SECTION II.

HEMORRHAGE.

THE dread of hemorrhage is instinctive in man. The sight of flowing blood is so appalling that the bravest can not look upon it with indifference. The unprofessional have a curiosity to witness a surgical operation, yet as soon as blood gushes, they turn away with a sickening sensation. The feeling is founded in the deeper sympathies of our social nature. The ambitious student longs to execute what he has seen performed in the amphitheater, but his boldness is restrained by the risk of hemorrhage, and the first time he operates his knife is moved by a hand influenced by hopes and fears. Gushing blood startles at first, but by an inherent quality of shrinkage in the coats of the divided vessels, the wasting streams grow less every moment, and the courage and confidence of the youthful operator increase in a proportionate ratio. Once initiated into the mysteries of hemorrhage, the young surgeon lays aside unfounded fears, and cultivates a rational precaution against engaging in what the experienced would deem as a display of rashness.

Nature has quite efficient means of her own to arrest hemorrhage; and before those of the surgeon's art are enumerated, hers should be considered. As has been intimated, there are contractile and retractile powers in the coats of arteries, the first of which diminish the calibre of the vessels, and the second bury their divided ends in the surrounding structures, thus favoring the formation of coagula to act as plugs to the bleeding orifices. It is not unfrequent during the performance of a surgical operation to see several jets of blood spurt from divided vessels, and then subside, as it were, and become lost to view. The forces just mentioned arrested the flow, artificial aid not being requisite.

Nature has other efficient means for arresting the flow of blood, and these often save life *in extremis*. I refer to syncope. The brain and great nerve-centers being deprived of blood, a state of suspended animation occurs, during which the heart ceases to throw the blood out through the divided arteries, and the coagulating qualities of the blood now have time and opportunity to form clots, and they readily do so; the fainting victim, in a fallen and prostrate position—a state favorable to the preservation of the vital spark while the fit of syncope is on—gradually recuperates from the condition of vital suspension; the heart slowly regains its wonted action, and the lost energies of the body are at length restored; but the coagula in the mouths of the bleeding vessels are too firm to be displaced. Nature saved a life that was nearly lost. Surely her resources are not to be despised.

The chief means the surgeon employs to arrest hemorrhage, and to prevent an exhaustive waste of blood, may now be recounted; and among the most ancient are styptics. These are usually selected from astringents, though coagulants (lint and other fine fibrous substances) have very properly received some attention. Several of the salts of iron, as the persulphate and the perchloride, have enjoyed the best repute as styptics. The coagulants, as their name implies, favor the formation of clots, acting as centers of coagulation, as a thread may become a center of crystalization in congealing fluids. The surgeon avoids the use of styptics and coagulants when possible, as they are not very reliable, and leave the wound encumbered with foreign substances. However, the best styptics will ever hold a subordinate place among the arresters of hemorrhage.

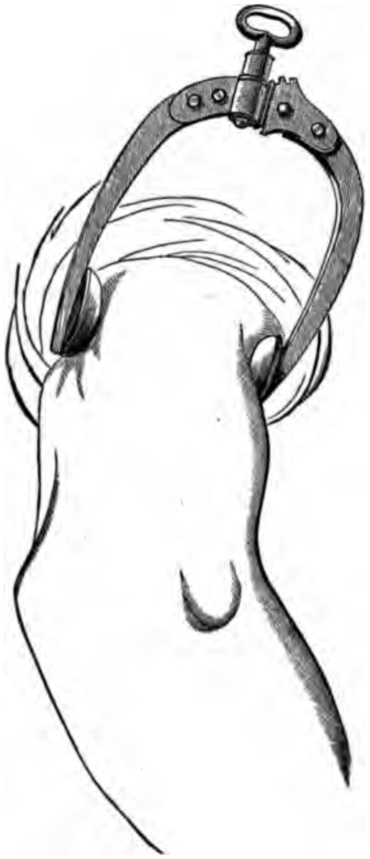
There are certain constitutional remedies more or less efficient, which may be mentioned in this connection. Ergot has the reputation of arresting uterine hemorrhage; and unless the agent spend its action upon the womb, to the exclusion of other parts of the body, which admits of a reasonable doubt, the medicine may be employed to arrest hemorrhage of the lungs or of other parts of the organism.

Hamamelis has been put forward as a rival of ergot and erigeron, as a specific in hemorrhages from the uterus, and it is to be hoped that a more extended experience may favor its champions. Antimony, and the nauseants generally, have their advocates as constitutional blood arresters, but if they exert any valuable influence it is done indirectly by lessening the force of the heart, therefore veratrum is more than a substitute for the whole class. Much can often be gained by position in attempts to check the flow of blood. A wound of the palmar arch is decidedly dangerous; and the arrest of hemorrhage can sometimes be controlled by holding the hand as high as practicable above the head. Forced flexion of the limbs will frequently arrest the flow of blood through the larger arteries.

Compression of the artery at a convenient spot on the cardiac side of the wound, is an important method of arresting hemorrhage. The fingers may be employed as compressors, yet as they soon get tired, compressing instruments have been invented to take the place of digital force. The tourniquet of Petit is an instrument composed of a pad to press upon the main artery of the limb; a webbing strap to surround the limb, and a buckle to fasten it; and two brass plates which are compelled to separate by the movements of a thumb-screw, thereby making the strap tense and the pad a compressing medium. But the instrument has serious objections; in the first place, it constricts all the structures of the limb, and not the tissues at only two points, as the horse-shoe tourniquet does; in the second place, it can not be made to compress the brachial and femoral arteries near the body; and in the third place, it prevents the free return of blood in the veins. Every young operator has been startled at the gush and splash of blood which suddenly follows a severance or division of the principal veins while performing an amputation; and it is a needless waste of blood. The horse-shoe tourniquet, figured in the diagram, compresses only the artery, the veins being left free to empty themselves. The instrument can be used in any case where the ordinary tourniquet is applicable, and also near the trunk, where it is not possible to apply the Petit instrument. The horse-shoe tourniquet can be used to compress the axillary artery, the supporting or fixed pad being made to rest on the shoulder; and the femoral, as it emerges beneath Poupart's ligament, can be compressed against the pubic bone by placing the fixed pad against the buttock. With this instrument amputations can be performed at the shoulder and hip joints without a skilled assistant to compress the arteries.

The arms of the instrument are hinged together in combination with a thumb-screw, which applies the power. The pressure can be regulated with as much nicety as can be employed with any other tourniquet. The pad on the movable arm of the instrument is smaller and more conical than the one on the fixed arm. This is so it may sink into the flesh, and compress little except the artery. The entire instrument is made of steel, except the upholstering of the pads, therefore it has no straps to weaken with age, nor buckle-tongues to become brittle through oxidation. In fact, the horse-shoe tourniquet combines many valuable qualities, and few objections of any importance. If an operator of moderate means possesses this instrument, he need not necessarily be to the expense of buying an ordinary tourniquet. Since the introduction of Esmarch's elastic bandage and tourniquet of caoutchouc tubing, there is little use for a tourniquet of any kind, yet there are cases, as of mutilation, in which the patient is not in condi-

Fig. 15.



Horse-shoe tourniquet applied to the brachial artery.

tion to undergo amputation at once, but is bleeding from a severed or lacerated artery. Now, to obviate the hemorrhagic loss until an amputation can be performed, an instrument should be employed to arrest the flow of blood. The common tourniquet is not fit to be employed, for reasons already named; and the elastic bandage does not work well on a torn and mutilated limb. The horse-shoe tourniquet was invented to compress aneurismal arteries; and as a "compressor" in the treatment of aneurisms, it serves an excellent purpose.

Elastic compression of an entire limb, to drive the blood out of the veins and capillaries, and to prevent its entrance through the arteries, was introduced into surgical practice by Esmarch. His apparatus consists of a bandage, made elastic with rubber weavings, and a tube of caoutchouc, half an inch in diameter, and two feet in length. The elastic bandage, in case the thigh is to be amputated or operated upon, is made to snugly wrap the foot, ankle, leg, knee, and thigh to a point above the operative line. The tubing is then to be tightly thrown twice or three times around the limb just above the upper edge of the bandage, and its ends fastened, so as to constrict the arteries. The tubing is practically a tourniquet; the bandage has served to drive the blood out of the limb, and is to be removed before any cutting is undertaken. The advantages of the method are, the saving of what blood the veins of the limb contain, and the neater operation which can be performed when no blood is lost; the disadvantages are, that the bandage tends to force septicæmic fluids into the general circulation; and that, in a plethoric individual, a disproportionate amount of blood would be driven into the vessels of the body.

A dressed wound commonly has its walls held firmly in contact, so that more or less compression is made upon bleeding vessels. In a hare-lip operation there is no necessity for any blood arrester, except the ordinary dressing which holds the bleeding surfaces in contact. It would be tedious to enumerate the instances in which the sides of wounds forced into snug coaptation, arrest hemorrhage.

Plugging is a method of arresting the flow of blood from cavities and penetrating wounds. Hemorrhage from the uterus can generally be controlled by the efficient application of a tampon to the vaginal cavity. The bleeding socket of a tooth can be plugged with wads of lint—a probe, hair-pin, or other awl-like instrument being employed as a plugger. After the cavity is filled the jaws may be held together with a handkerchief tied around the head. In two or three days a sufficiently firm coagulum will form to render it safe to remove the plugs of lint. During the time the handkerchief is worn, the fastening may be taken off at intervals while food is eaten.

Epistaxis, or hemorrhage from the nose, may become alarming, but rarely proves fatal. The use of cardiac and arterial sedatives lessens the impulse of the circulation, and thus accomplishes something in the way of restraint. Plugging the posterior and anterior nares by means of the spring and canula of Bellocq, proves effectual in obstinate cases of bleeding from the nose. The same object can be attained by a much simpler process which was first proposed by Dr. W. Perry, of Exeter, N. H. He advises, when necessity calls for a plugging operation, that a flock of raw cotton be rolled into a cylinder an inch or more in length, and a strong thread tied in its middle. The string is useful in removing the posterior plug, and in holding the anterior tampon in place. The cylinder is doubled by bringing its two ends together, and then pushed into the nostril, the fold or loop, where the thread is tied, taking the lead. The entering end or loop is to be pushed back with a pencil or grooved director an inch or more, and its effect observed. If the blood be prevented from coming forward, but escapes into the throat, the pledget is to be pushed still further back, until the bleeding surface is in front of the plug; then another flock of cotton is to be pushed into the anterior nasal opening and fastened there with the ends of the thread which hang out of the nostril. The loose and hanging parts of the thread are to be turned upon the side of the nose or cheek and held there with a piece of adhesive plaster. The plugs are to be left in place two or three days, when the tamponing mass may be easily removed by traction on the thread.

It is to be borne in mind that the plugs may be wetted or dusted with styptics before being introduced into the nostrils. The chief advantage of this plan is that it can be executed in any household, no special instrument being required in the operative procedure.

A penetrating wound, say in the arm-pit, can be densely packed with compresses, or pieces of lint, a bandage being used to hold the last piece in place. Unless such compressing substances be well applied and kept steadily in place they prove to be useless.

The ligature is the most commonly employed and reliable agent to arrest the flow of blood. In amputations the arteries are ligated near their divided ends. The blood in the vessel coagulates up to the first branch above the ligature. In a few days the ligature sloughs away, little or no danger attending the removal. In rare instances the slough is too deep, permitting what is called "secondary hemorrhage." In severe wounds in which the bleeding vessels can not easily be caught with forceps and then ligated, the main artery of the limb has to be cut down upon and there secured with a ligature. Emergencies of this kind are, fortunately, exceedingly rare. During the removal of large tumors from vascular regions, as in the neck, several vessels may require ligation, though the ligature is not so necessary as once supposed.

When a ligature is employed it should be a piece of saddler's silk, or a strong thread of linen, hemp, or cotton. The agent should be applied snugly, so as to mash the inner coats of the artery, but not to divide the external or fibrous coat. As little disturbance as possible should be inflicted upon surrounding structures. The ligature becomes detached in from five to twenty days, generally in from twelve to fifteen days.

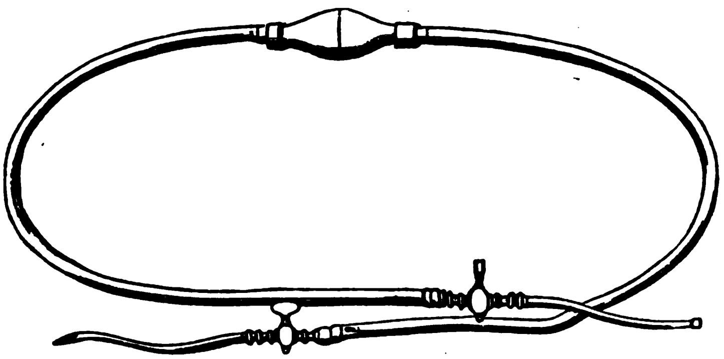
Torsion, or the twisting of vessels, using forceps for the purpose, serves to effectually arrest hemorrhage, even from the large arteries. In Guy's Hospital, London, where amputations occur daily, the ligature has not been used for several years. In country practice, where there is nobody at hand to arrest bleeding in the event that the twisting and mashing were not effectual, it is best to still employ the ligature, though in a hospital the risk could be afforded. However, the example of dispensing with the ligature in a large European hospital having been set, it is not improbable that the same course will soon be tried in places of lesser note. It was once customary to arrest hemorrhage with the "actual cautery," or the application of a hot iron to the bleeding surfaces. The iron was heated to a white heat before it was applied. Such a cautery is occasionally used at the present time, especially to wounds otherwise inaccessible. The difficulty is to get the implements ready in season, and to transfer the searing instrument from the fire to the wound with sufficient celerity to prevent too great a degree of cooling. The cautery at a red heat is worse than useless, its removal tearing off the eschar.

The history of transfusion dates nearly back to the discovery of the circulation of the blood, yet a satisfactory process for transferring the vital fluid from the veins of one individual to those of another, was not reached until quite recently.

The earliest experiments in transfusion were made upon animals, and great success was claimed to have been attained; but when similar operations were repeated upon human subjects, the results were far from satisfactory. Early in the present century Dr. Blundell, of England, conceived the idea of saving the lives of women who were quite exhausted from uterine hemorrhage, by transfusion; and he instituted a series of experiments upon animals for the purpose of applying the practical experience thus obtained in reviving obstetric patients who might need the benefit of the art. He invented a syringe which he employed to throw blood into the veins of an anæmic woman after it had been drawn into a basin from the veins of a man who could readily bear the loss. The blood was kept at a temperature of 100° until thrown into the arm of the patient. Dr. Blundell used the blood of calves and lambs when he could not obtain human blood, but never with much satisfaction.

At present the operation of transfusion is performed as follows: The arm of the patient above the elbow is constricted with a cord, to raise as much of a vein as possible; an incision is made into the most prominent vessel, whether it be the median or basilic vein; and in the venous wound the effluent tube is inserted, with the nozzle directed upward, an assistant holding it in place; the arm of a full-blooded man is to be treated in the same way, though the affluent tube, which has a tubercle near the end of the nozzle, is to be inserted with its receiving end directed downward, another assistant holding it; the rubber hose with its valve shut, is now attached (the pieces easily join with a slide), and the valve opened to fill the rubber bulb in the middle of the instrument; the valve is then closed, and the charge of blood is forced out of the other end of the base, the valve on that side having been opened to let the fluid escape—this is to make sure that the apparatus is in working order, and that a supply of blood is at command; then, before the central bulb is allowed to expand, the effluent hose is emptied of air by stripping it through the fingers, and closing the valve. The attachment is now made with the effluent nozzle, the cord removed from the woman's arm, and the apparatus is in readiness for transfusing blood. The operator, while holding the bulb in a collapsed state, opens the affluent valve, and then lets the bulb fill by letting the thumb and finger loose. The affluent valve is now closed, and the effluent valve opened, while compression of the bulb empties the instrument by forcing its contents into the veins of the patient. About two fluid drachms of blood are forced into the veins of the patient at this discharge. The effluent valve is now closed, the affluent is opened, and the bulb allowed to dilate as a new supply of blood is received; then the affluent valve is closed, the effluent opened, and by compression of the bulb another charge of blood is transfused to the patient's veins. The same series of manipulations are to be kept up, until from six to twelve ounces of blood are transfused. The nozzles are then to be withdrawn from the veins, and the wounds dressed with strips of adhesive plaster. In a few minutes the patient will be attacked with a rigor and spasmodic state, attended with apnœa and other unpleasant symptoms, unless the vapors of ammonia and chloroform be passed before the nose to avert the complication.

FIG. 16.



Aveling's instrument for transfusion.

The apparatus is to be kept as warm as practicable while in use; and it is well to run a stream of warm water through it, before blood is let into it. And after transfusion the instrument is to be well cleansed by pumping water through it. The instrument is Aveling's invention, and is exceedingly simple in its construction and mode of working.

The most difficult part of the procedure is to raise a vein in the arm of the recipient, and to introduce the effluent nozzle well into it so no air will enter. As soon as the vein receives the nozzle, the constricting medium may be removed, and the vein pressed upon by the assistant's finger until ready to receive blood. The affluent nozzle in the man's vein is easily held in place by an assistant's finger which presses the walls of the vein against the knob on the tube. If the vein be raised from its bed, a ligature may be temporarily thrown around the vein and tube. After the nozzles are removed there is said to be danger of phlebitis, but this can not be great.

It is not always easy to find a vein in a bloodless patient. If one in the arm can not be found, the saphena in the leg may offer a better opportunity to receive the effluent nozzle, though the danger from phlebitis is greater in the leg than in the arm.

The operation of transfusion may be repeated every few days, if no untoward condition declares against the procedure. Generally a patient is at death's door before transfusion is attempted, therefore its record is not very flattering. It is idle to suppose that a patient nearly dead from consumption can be anything more than temporarily revived by the reception of a few ounces of healthy blood. This borrowed capital only puts off for a limited period the general bankruptcy which is impending. Unless a patient's blood-making organs can be so far restored in function that they may elaborate fresh supplies to correspond with the waste, the introduction of a small quantity of healthy vital fluid, is like a starving man taking a little food; the relief is pleasant, but it is temporary, unless the supply can be kept in harmony with the wants of the body.

Transfusion is a valuable therapeutic resource; but it is not to be drawn upon when there is not a rational indication for its employment. In the earlier attempts at transfusion a flexible tube was used with the idea that blood would flow across from one individual's veins to another; but it is now known that very little blood will thus pass; and there is danger of obstruction through coagulation, and the passage of small clots which may produce embolism. The bulb of the instrument figured in this account of the latest method for performing transfusion, is to draw blood from the plethoric vein by suction, and to force it into the patient's vein by the compressing power of the thumb and finger.

The drawing of blood into a basin kept warm by resting in hot water, and then the injection of the same into a vein with a syringe, constitute a dangerous process, inasmuch as air is liable to get into the veins while the experiment of transfusion is performed. It will be seen at a glance that transfused blood to be most beneficial to the recipient, should flow directly from one individual to the other without exposure to air, or a temperature favoring coagulation. Transfusion badly performed is a fearfully dangerous experiment. Those unacquainted with the details of the operation should experiment upon dogs until every step in the process is made familiar.

Fewer lives are lost by hemorrhage than is commonly supposed. Probably more die from uterine hemorrhage than from all other causes combined. When an arm or leg is fearfully lacerated by the forces of moving machinery, the torn vessels rarely bleed much. The mashing process prevents the flow of blood. Surgeons have taken a hint from such accidents, and invented the ecraseur for removing tumors which can be surrounded with a wire or chain. The effect of the instrument is to crush, bruise and sever the tissues included in the noose; and little or no hemorrhage follows.

WOUNDS.

A wound has been defined by a medico-legal writer as "a recent solution of continuity in the soft parts, suddenly occasioned by external violence." The definition is rather comprehensive, but not very clear and definite. It does not embrace simple fractures, dislocations and sprains; and if the "solution of continuity" refer to a division of the skin and mucous membrane, the term does not cover contusions, concussions, and ruptures of the viscera. According to the older authorities, a kick in the abdomen which lacerates the liver, but does not break the skin, would not inflict a *wound;* but recent definitions generally regard mechanical injuries as wounds, whether there be solution of continuity or not. A bruise should be considered as much a wound as a cut or laceration. Burns and scalds are traumatic, yet they are classed as injuries distinct from wounds.

Traumatic states resulting from personal encounters, or from causes likely to undergo judicial investigation, should be carefully observed by the surgeon in order that he may be enabled to acquit himself well as a witness. The location, length, depth, and direction of a wound should be noted, and an estimate made upon its character, regard being had for its seriousness, or danger to life, for the bail of the assailant may depend considerably upon the surgical opinion rendered.

Wounds have been divided according to their nature, and the character of the infliction; consequently, we have the contused, the incised, the punctured, the lacerated, the poisoned, and the gun-shot.

Wounds are to be managed with regard to safety, rapidity of cure, and to defects and deformities which may be sequences. Generally the first duty is to arrest exhaustive hemorrhage; then, in the dressing, accidents or complications are to be considered, and avoided if possible. Tetanus is an occasional sequence of punctured and lacerated wounds, therefore it should be guarded against. Erysipelas, septicæmia, and purulent collections, are to be anticipated, thwarted, and relieved, if possible. In many instances "an ounce of prevention is worth a pound of cure." A foreign body overlooked, and left in a wound, may prove a serious complication. A man received a wound in the heel from a mowing machine, and the surgeon neglected to discover the point of a broken tooth which lodged in the os calcis, and subsequently killed the patient by provoking tetanus. A man in anger threw a paint-brush at a fellow workman, and the point of the handle penetrating deeply between the thumb and forefinger, broke off, and remained several months, when amputation was performed to get rid of the diseased hand. An examination of the separated part disclosed the cause of the prolonged morbid action, and revealed the fact that the use of a probe and forceps might have saved the hand. Mistakes of the kind happen frequently, and reflect discredit upon those who practise surgery.

Wounds present a variety of aspects, from the simple cut made by the pocket-knife, to the horrible lacerations, mashings, and mutilations produced by threshing and other powerful machinery, and railway accidents. A hand caught under a moving belt, may before it can be rescued, result in tearing the arm from the shoulder, or the shoulder from the trunk.

The healing of wounds occurs in two principal ways, and by three subordinate methods. When the edges of an incised wound are held in apposition they unite quickly and directly without the agency of any new material, unless it be a small quantity of a glutinous substance exuded from the capillary vessels. This has been called union by the "first intention," or immediate union. It occurs without marked inflammatory symptoms, and leaves no cicatrices. The success of plastic operations depends largely upon the readiness with which a flap of integument nearly dissected from its original position, and then twisted into a new position, will unite with the structure prepared for its contact.

Healing by granulation, or the intervention of new material, is union by the "second intention;" it is accomplished by inflammatory symptoms, and ends in cicatrization. The granulating process is attended by the formation of pus, and a more or less tedious process of repair. At first a mass of lymph is exuded from the minute vessels, and the white corpuscles of the blood appear in the chasm. This coating of plastic lymph is soon permeated with vascular shoots or buds which constitute ruddy elevations, and become the substantial parts of granulations. The unappropriated white corpuscles and exuded lymph, degenerate into purulency. Layer upon layer of granulations springs up to fill the breach or close the chasm; and when the level of the adjacent integument is reached, and a little more, the outer layer becomes transformed into fibro-cellular or connective tissue, and a film-like, epithelial covering, which is called a *scar*. During the development of the granulations and the formation of the scar, a process of contraction goes on, which accelerates the healing and contracts the tissues implicated. In fact, the cicatrix, in some instances, puckers the surrounding integument, and, being devoid of elasticity, draws upon adjacent parts sufficiently to create deformities.

A modified form of union in the healing of wounds, is by the intervention of considerable plastic lymph, but no granulations. This is called union by primary adhesion, and is merely a modification of the two chief methods. The edges of the wound are not brought into actual contact, as when union by the first intention occurs, but a little space is left which gets filled with plastic or adhesive material, yet does not require the agency of granulations to accomplish the reparative act. A moderate grade of inflammation accompanies the process, and a perceptible scar indicates that the union was not by the first intention.

Another modification of the healing process is that in which a layer of granulations occurs on the face of surfaces resting in contact. If these surfaces become adherent without such agency the union is that by the first intention, but as granulations intervene, though not in superimposed layers, as in the second of the two leading methods, the union is called that by secondary adhesion, or, by the third intention. This process of healing takes place mostly out of view, in the deep parts of wounds, as between the flaps of an amputated stump. If the granulations are healthy, and not disturbed, the blending of the layers may occur without the development of pus.

The healing of a wound under a crust of dried lymph, which is called a *scab*, is defined as a process distinct from either of those mentioned. The union is the most common, and perhaps the most natural, of all the healing processes. Sometimes a layer of dried blood forms the scab, and at others dessicated lymph and pus, with entangled dust and fibrous material, constitute the lid or adherent covering. The reparative process carried on beneath the scab can not be watched, but it is presumed to differ somewhat from either of those described. The exuded lymph is permeated with new vessels, but no true granulations are formed; no pus is developed, and no permanent scar follows the shedding of the scab.

The incipient phases of inflammation attend union by the first intention, and more advanced action would defeat the process; a moderate grade of inflammation is necessary for the production of the material which serves as a solder or uniting medium in the adhesive method of union; and a fully manifested inflammatory action results in the development of granulations, the production of pus, and the formation of cicatricial tissue. A high grade of inflammation may prove destructive, therefore, in the treatment of wounds, it is rare that an increase of action should be provoked, and in most instances the inflammatory activity ought to be restrained or held in check. The cure of a hydrocele is effected by provoking an adhesive grade of inflammation in the tunica vaginalis testis; and some fistulæ and sinuses are destroyed by exciting a lively inflammatory action.

A *contused* wound is what is ordinarily termed a " bruise." The integument may be simply abraded, yet the tissues beneath may be extensively lacerated, blood being extravasated to a degree which is manifest in discoloration. Serum and lymph are effused soon after the injury, and these fluids become blood-stained. At first the extravasated blood may be so deep as not to show through the skin, but it does not take long for the discoloration to be plainly visible. A simple fracture is frequently accompanied with a contused condition of the soft tissues and the extravasation of blood from ruptured vessels; and the depth of the injury may be so great that days may be required for the blood-stains to be apparent beneath the integument; and when they do appear the blood has undergone decomposition, or has changed in hue, so that the region presents a greenish aspect, which alarms the patient, incipient mortification being suspected.

Extravasated blood, attended with discoloration, is called *ecchymosis*, a familiar example of which is a "black-eye." The extent of the extravasation and the amount of the discoloration depend much upon the nature of the structures bruised. The more lax the textures the more copious the extravasation; and the thinner the skin the more vivid the discoloration. The eyelids, the scrotum, and the labia exhibit the most marked ecchymoses. The delicate skin of the female is discolored by a moderate blow or pinch, while the hardened face of a prize-fighter will sustain fearful blows without exhibiting evidence of the force applied.

When the extravasation is considerable, clots may form, inflammation run high, and suppuration take place. Septicæmia is not an infrequent sequence of a severe contusion. If such be not the termination, the stagnant blood undergoes decomposition, passes to liquefaction, and is at length absorbed by the veins or lymphatics. In some instances it seems at length to be transformed into reparative material, and not into detritus or waste, to be excreted or eliminated.

The nervous shock attending a contusion is usually proportionate to the amount of damage sustained. However, contusions of the testes, mammæ, and other sensitive parts of the organism, are often followed by sinking sensations, feebleness of the pulse, and temporary loss of muscular power.

The swelling which immediately follows a contusion is marked, even when there is no extravasation of blood to distend the tissues. The rapid effusion of lymph causes the protuberance, as illustrated by the lump that quickly follows a "bump" of a child's head. The wheal which suddenly rises after the cut of a whip is another example of the rapid swelling due to afflux of blood, and exudation of serum from the injured vessels.

The discoloration attending a severe contusion and much extravasation, is usually quite black, while that of moderate injuries is crimson or pink, the lighter shades coming from the sanguineous staining of exuded serum and lymph. After a variable time, the period depending upon the extent of the injury and vital activity, these colors change in tint, from "black and blue" to brownish-olive, green and yellow.

The treatment for a contused wound is generally simple, and the result satisfactory. The application of aconite, arnica, camphor, and kindred agents constitutes a safe and efficient course to be pursued. The extravasated blood is disposed of as just indicated, the exuded lymph is used in the repair of lacerated textures or is removed by absorption, and the functions of the part are rapidly restored. If the discoloration be upon the face, the patient is anxious to have it removed as quickly as possible. Leeches were once used to extract the extravasated blood, but when it was discovered that the creatures only took the circulating medium, they fell into disrepute. A piece of raw beef is a popular shield to apply to an ecchymosed face, but it is not probable that there is any particular virtue in the remedy. The application of flesh colored adhesive plaster, in narrow strips and short pieces, will mask the defect quite cleverly, yet the dressing makes the parts covered feel stiff. Flesh-tinted paint skillfully penciled upon an ecchymosed spot, is the very best disguise; but the physician does not always have the paint within reach. The toilet stand of a Parisian belle might furnish the materials to cover a cutaneous defect.

A contused wound is rendered comfortable by the use of a cataplasm of some kind. A poultice of linseed is as good as any, the chief object being to exclude the air, and to maintain an equable temperature.

When the extravasation of blood is excessive, an outlet should be provided in the shape of an incision. Although the operation may hasten suppuration, the result will be more satisfactory than when left to itself. Contusions about joints are somewhat dangerous, and, consequently, should be actively treated with fomentations and anodynes. Should the inflammation run high, cold water poured upon the part for an hour at a time, and repeated two or three times in a day, is often one of the most valuable of remedies.

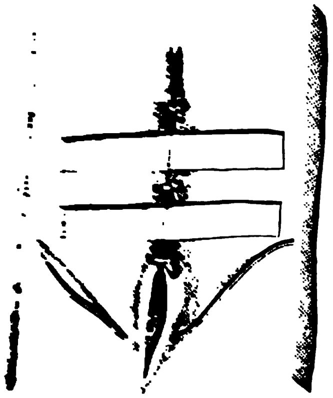
Incised wounds, or those made with sharp, cutting instruments, are usually attended with brisk hemorrhage at first, and keen pain. Retraction of the integument bounding the incision may produce considerable gaping in the wound, which has to be overcome by sutures, adhesive strips or bandages. The bleeding can generally be controlled by simple means, such as the application of cold water, and pressure applied so as to hold the edges of the wound together or in apposition. The section of a large artery might require a ligature. The pain usually subsides in a few minutes, and rarely requires the quieting influence of an anodyne. The nervous shock commonly passes off in a few minutes; if not it may be subdued with warm drinks, stimulants, or anæsthetics. The swelling may be moderate or marked; if sufficient to make the dressings tense, bandages or other tight wrappings should be loosened.

In the management of incised wounds it is often best to hold the edges of the divided integument in contact by means of adhesive plaster. Strips of the common material may be employed, the wax being melted by the heat of a live coal, blaze, or hot stove; but the "ready cut" adhesive plaster, made sticky by wetting, is the handiest and otherwise the best. It is sold in rolls or spools, and put up of various widths. The linen back is strong, and the adhesive material remains the same throughout the different seasons of the year.

In the dressing of an ordinary incised wound, the strips of adhesive plaster should extend across the incision to the distance of an inch or more. The integument in the vicinity of the wound is to be dried with sponges, napkins, or old muslin, so that the adhesive plaster can make a secure fastening. One end of a strip is to be applied first, and allowed to dry and adhere, before the edges of the wound are pressed together, and the other end of the plaster made to adhere. A little care in the application of adhesive strips will generally result in the snug closure of a wound inclined to gap. Sometimes quite long strips of plaster are required to hold the borders of a deep wound steadily in apposition. Strips applied obliquely over parallel strips seldom do any good, and their removal is attended with pain. In the strapping of a wound it is generally best to leave one or more small spaces between the strips, to allow an escape of pus or other fluids.

If sutures seem to be necessary, they should be silver, and of the interrupted variety. A glover's needle armed with silk twist, or virgin silver wire the size of a sewing thread, is passed from lip to lip of the wound, and then a knot is made if the suture be of silk, and a twist for a fastening if wire be used. The knot should rest a little to one side of the line where the edges of the wound meet, and the force exerted upon the suture in closing the

and [illegible] culation in the bit
blu[illegible] wire. Much tension
T[illegible] gold, or platinum,
the [illegible] cluded in the loop.
ca[illegible] which is generally near
to[illegible] may be inserted on each
in[illegible] inch, more or less, the
[illegible] much upon the length,
[illegible] objection to sutures is
[illegible] the stitches have been
[illegible] to gap, strips of adhesive
[illegible] tures; and it is well to apply



[illegible] strips placed between stitches.

[illegible] wound, to cover the fastenings of the [illegible] the rough ends are apt to catch in the [illegible] long on the borders of a wound, the [illegible] until the parts have been shaved. [illegible] used on the scalp on account of the [illegible] must be made to hold the edges of the [illegible] Surgical writers usually enter a protest [illegible] of sutures in dressing wounds of the [illegible] raised that the stitches provoke erysipe- [illegible] if silver wire be used the danger is

When adhesive strips are used in the dressing of wounds, no lotion is to be employed, as the fluid might overcome the sticking qualities of the plaster. A lotion of aconite, arnica, or camphor, may be used upon wounds of the scalp where silver sutures are employed.

Redressings ought not to be repeated oftener than necessary, for the manipulation disturbs the healing process. On the third or fourth day the sutures, if any be employed, may be cut on one side of the twist, and carefully removed, the withdrawal of the divided loop being in a circular direction, to avoid inflicting useless injury to the neoplastic material. The disengagement of adhesive strips is to be accomplished by raising the ends of the plaster, peeling them up to the edges of the wound, and then turning the remainder over in the direction of the traumatic line. This precaution may prevent tearing open the wound. A moderate amount of pus is not detrimental—at least not more so than a free use of the sponge to cleanse the wound. Laudable pus is free from irritating qualities, and really exerts a shielding influence to delicate granulations—it is " nature's balsam."

It is rarely necessary to employ constitutional remedies in the management of incised wounds. Acute pain may be curbed with an anodyne, and febrile symptoms checked with aconite or veratrum.

Incised wounds generally heal by the " first intention," though extensive traumatic surfaces may require for their union " adhesive inflammation," or even the " granulating process." The treatment is to secure reparation by the simplest and quickest methods of healing, therefore rest in easy postures is to be enjoined. A divided muscle will not unite to the best advantage, if disturbed by moton or action.. A bandage may be needed to keep the parts at rest. Surgical wounds of an incised nature are not always of the simplest character. A deep incision made to remove an exostosis, may imprison blood and other fluids which will decompose and poison the patient, therefore a portion of the wound should be left open, and a drainage tube should be inserted in some instances.

Punctured wounds are those which are inflicted with slender instruments, as needles, thorns, nails, splinters of wood, glass or metal. The importance of such wounds depends much upon their location, depth, and the textures penetrated. A simple puncture made with a smooth and clean implement, is rarely serious, and [illegible] first intention or adhesive inflammation. [illegible] greatly upon the systemic condition of the [illegible] of a briar may be followed by serious consequences. Then again, the implement may convey a poison [illegible] intractable disease. Punctured wounds made [illegible] instruments of large size, such as daggers, [illegible] spears, may also be *penetrating*, and serious on [illegible] their size and depth; and dull or blunt instruments [illegible] which from the elasticity of the skin, may leave [illegible] insufficient to drain the wound, consequently danger [illegible] the imprisonment of decomposing blood and other [illegible] fluids. Punctured wounds of the palmar and plantar [illegible] and other dense or tough structures, are often followed by [illegible] disorganization and severe constitutional disturbances; [illegible] injuries should be treated with caution and circumspection. Anodynes may be required to subdue the pain and [illegible] and the wound should be enlarged and poulticed. Intense pain in the back and limbs, rigors, and nervous agitation, are not always the precursors of tetanus, but they constitute [illegible] of sufficient gravity to command the strictest attention.

The subcutaneous wounds made in the performance of tenotomy are of a punctured character, yet the polished and cutting steel seldom produces a puncture which will not readily heal without serious complications.

Tooth-wounds are of the punctured variety, but of a nature to warrant a distinct classification. The sharp teeth of the lower animals do more than inflict a simple puncture—they bruise and tear the flesh, and sometimes leave in the wound more or less poisonous saliva or other fluids which prove noxious. It is not safe, therefore, to treat a tooth-wound as a simple puncture, but to keep in view the propriety of using antiseptic dressings, and to recognize the necessity for suppurative inflammation as a sequence. A bite is accompanied with a crushing or bruising of the parts embraced between opposing teeth, therefore a state of sloughing is not uncommon.

Lacerated wounds are those made with tearing or rending agencies, as with a saw, rough surfaces of wood, stone, or metal, in motion, and the irregularities of hard substances with which any part of the body may be brought in violent contact. Such wounds are not excessively hemorrhagic, the torn and shocked vessels showing little disposition to bleed; but they exhibit an irregular solution of the integument and of the deeper tissues, which denotes that an attempt to make the serrated and ragged structures unite by the first intention, or even by adhesive union, would prove fruitless. Not unfrequently portions of integument and of deeper structures are lost, consequently the gaps must be filled by the granulating process. Lacerated wounds produced by threshing machines, and a thousand varieties of rapidly moving machinery, are often frightful mutilations, which, if they do not terminate fatally, can not be saved from hideous deformity.

The management of lacerated wounds depends much upon circumstances, or the conditions of the injury; sometimes it may be best to remove with knife or scissors any pieces of skin or flesh that are so isolated that they will be likely to perish, or if they were saved they would be a source of annoyance. Generally it is well to save as much of the living tissues as possible. Sutures may be employed where adhesive strips will not hold torn integument steady. But unless there be an urgent need for sutures they are not to be used, but loose and partially detached structures are to be held in place with adhesive strips, compresses, and bandages.

Lacerated wounds frequently have dirt and foreign substances forced into the torn tissues, therefore precaution should be exercised that the denuded and ragged surfaces contain no extraneous matter. Fragments of glass and coal will not prevent a wound from healing, but the pressure of such material in the soft tissues will be a source of trouble until cut for and removed.

It has been customary to apply camphor, aconite, or arnica, to lacerated wounds, and there is no objection to such lotions unless they disturb the adhesive part of the dressing. I am inclined to think that wounds generally do as well without lotions as with them. After the active inflammatory symptoms subside, and adhesive plaster is no longer useful, the healing surfaces may be dressed daily with Mayer's ointment or any simple cerate. Exuberant granulations may be occasionally touched with carbolic acid or any mild astringent or caustic.

Severe nervous shock and pain are to be subdued as in the management of wounds in general, and undue febrile symptoms may indicate the administration of gelseminum or other arterial sedatives. In the event of profuse and protracted suppuration, the use of mineral acid and quinia may prove beneficial.

What is called *antiseptic surgery* is receiving considerable attention in the treatment of wounds, though it is yet an open question whether infecting germs can be excluded from traumatic surfaces. Professor Lister pretends to accomplish that object by filling the operating room with carbolic spray, and carbolizing all instruments, sutures and dressings. If an amputation be performed, the flaps are to be approximated as accurately as possible, and the wrappings literally sealed, to exclude the germs of bacteria and vibriones, or whatever subtle agency may be the cause of putrefactive changes. In other words, air, which is presumed to be swarming with organic germs, is to be excluded from traumatic surfaces. The champions of the antiseptic system claim unprecedented success when its principles are carefully executed. But the rules are so numerous and intricate that few surgeons are so circumstanced that they can put them in execution. Besides, it is claimed by good observers that bacteria will live and thrive in the carbolated solutions employed by Lister as germicides.

Dr. James R. Wood, of Bellevue hospital, N. Y., has been experimenting on the plan of keeping wounds open, especially after amputations and resections; and his success has been wonderful. By his method, the flaps of an amputated limb are not approximated, but left entirely open. A pillow of oakum is placed under the stump as a cushion and to absorb fluids, and thus the limb is kept until the wound is nearly healed. A small piece of gauze is placed over the contour of the stump, and a cradle is thrown over the limb to prevent the bed coverings from pressing the sensitive extremity. Neither sutures nor adhesive strips are employed, no charpie, no bandage, no oiled silk, in fact nothing beyond the gauze just mentioned. The wound being drained freely, no pocket is there to catch a pool of fluid. Each day a little balsam of Peru is poured upon the traumatic surfaces. A fresh cushion of oakum is furnished every day ; and all fabrics which have absorbed fluids are removed. The stump is washed by a stream of water poured upon it every day. After all suppuration has ceased, the closing wound may be covered with adhesive strips. Patients having wounds treated in this way exhibit no suppurative fever, no erysipelas and no abscess in the vicinity of the wound. The drainage is so complete and the granulations are so fresh, that flies will not deposit their eggs upon the wound in summer.

Pneumatic occlusion was a favorite scheme of Maisonneuve, it being alleged that the atmosphere exerts a baleful influence upon an open wound; and it is presumed that a majority of surgeons of the present day attempt to exclude the air from wounds, though a tendency toward lighter and lighter dressings has been going on for a long time.

Billroth, who is very late and reliable authority in surgical pathology, says that "free air does no harm to the wound; imprisoned air is very dangerous. If a stump is closed, and air is not permitted to gain access to the wound, the discharge which collects is pent up, and this forms a nidus for putrefaction; but, if left open, the effete material is carried off by the free and constant drainage."

GUN-SHOT WOUNDS.

The invention of gunpowder brought under surgical observation a large class of injuries not happening previously. Any lesion which occurs from the explosive force of gunpowder, whether it arise from blasting rocks, or the firing of a rocket, is denominated a gun-shot wound, though the injury does not essentially differ from such lesions as result from the explosive agency of steam, nitro-glycerine or dynamite. In most instances the wounding results from a bullet or missile projected by the discharge of a gun or pistol.

Those engaged in the art of war, or in the improvement of firearms, gunnery, and explosives, have from time to time contributed much to the efficiency and accuracy of weapons employed in the hurling of missiles. Rifled cannon which impel heavy shot at long range with great precision have nearly supplanted the use of the old smooth bores; the antiquated musket has given place to rifles which do execution at distances approximating a thousand yards; and pistols of deadly power are common in the pockets of citizens as well as soldiers. Projectiles, spherical and conical, are adapted to the various weapons; and gunpowder is manufactured chemically and in size of grain or kernel, to suit the varied purposes for which it may be needed.

Extensive treatises on military surgery are in the hands of every civil surgeon, so that the leading features of this special branch of practice are well understood by practitioners who have never held a commission in the army; and it is commonly supposed that any young surgeon desirous of entering upon a professional career in the service of the government, can, if duly qualified, pass the necessary examination. If a young medical man desires to enter the army, he should get himself enrolled as a student of one of the examining committee, or he should have some other potent influence to secure himself against being "plucked." I would not for a moment insinuate that an incompetent blockhead can buy a surgeon's commission in the army, but I have observed that the students of the examining board are exceedingly fortunate in getting favorably passed upon.

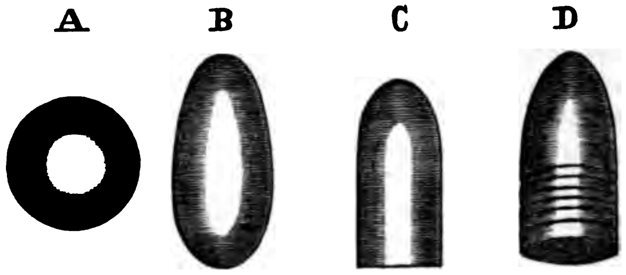
The pay of the army surgeon is beneath the average of the earnings of civil practitioners; and the wandering life obliged to be led by the military physician is not relished by those who have an inclination to indulge in domestic comforts. In advanced age, after long years of public service and moderate honors, retirement on half-pay is not a bountiful reward.

But the fact that a medical man has no aspirations for military service, is no good reason why he should not be familiar with the peculiarities of gun-shot wounds. Every day the rifle, the shot-gun, and the pistol are inflicting serious injuries in duels, hostile encounters, and in gunning excursions. A year does not pass but the ordinary physician is called upon to treat a gun-shot wound. Not unfrequently a coroner's inquest, or a judicial investigation, follows the shooting, and the surgical attendant becomes an important expert witness in the case. His testimony may be important in leading to the arrest and conviction of the assailant, or equally instrumental in affording life and liberty to an innocent person falsely accused. The surgeon as an expert witness may be able to determine whether an individual who has been shot has received skillful treatment or not. Patients suffering from bullet wounds not unfrequently die from injudicious probings, or through lack of care and attention. The timely amputation of a lacerated finger may have averted tetanus, proper dressings may have prevented an onset of erysipelas, and vigilant watching may have saved a case of secondary hemorrhage.

Projectiles traversing any part of the body leave two wounds, the one of entrance and the other of exit; and to discriminate between these is sometimes essential in establishing the guilt or innocence of an accused party. As a general thing the wound of entry is smaller and nearer circular than the wound of exit; and the edges are inverted, and ecchymosed to the distance of one or two lines; the wound of exit is usually larger than the missile, its borders are torn, and its edges everted. However, there are exceptions to this rule. A bullet may strike some part of the body in an oblique direction, and after tearing open a furrow for an inch or more, enter the deeper structures, and escape through a small aperture; and an elongated, conical ball may strike on its side, making a large opening, then turn in the flesh and pass out through the integument with its apex in advance. In such a case the wound of entrance would be larger than that of exit. And it has been observed that a swiftly moving bullet cuts holes of entry and exit like a punch, one being about the size of the other, with very little inversion or eversion of the borders of the wounds. Casper, in his "Handbook of Forensic Medicine," says: "The *wound of entrance* has its edges by no means always inverted, as all the text-books teach us, nor has the *wound of exit* its edges always everted, so that it can be thereby in dubious cases always discovered where the shot went in and where it came out. The conditions of the edges of the wound depend upon certain other conditions, besides the entrance of the bullet; and of this I have been completely convinced by the observation of a large number of persons shot, respecting whose position at the moment of receiving the wound there would be no doubt, since they were all killed before witnesses during street riots or barricade fights. For instance, if the person wounded, or if the part struck be very fat, such as the abdominal coverings, etc., the fat soon protrudes from the wound, and it—the aperture of entrance—is found to have its edges swollen and anything but inverted. In other cases, and those of frequent occurrence in medico-legal practice, the putrefactive process causes the edges of both wounds—when two are present—to protrude, and so prevents their being recognized either as the aperture of entrance or exit. Moreover, the soft parts, both at the wound of entrance and exit, are often so torn and mangled as completely to conceal the existence of any inversion or eversion of their edges. And there is still another peculiar case which of late has been of frequent occurrence, in which the diagnosis made from the state of the edges of the wound is perfectly deceptive—I refer to the case of wounds made with conical bullets. Their visible effect upon the surface of the body is usually perfectly different from that of round bullets, lead slugs, nails, stones, etc., for in such cases we only find a trifling, unecchymosed, slightly contused aperture, not always round, often more triangular, through which the conical bullet has entered, and from the appearance of which no one would for one instant suspect the amount of destruction which is to be found inside. Should the ball have passed through the body, the aperture of exit is precisely similar. This appearance is so constant, that it is by no means difficult, after a little experience, to decide *a priori* with certainty that a conical bullet has been used. But just because of these appearances I would recommend the greatest caution in regard to the answers to any queries respecting the apertures of entrance and exit in the cases of wounds with conical bullets."

Quite a variety exists in the shape of bullets now in use. The round shot is as efficient as a destructive missile in close action as the conical bullets of the most approved patterns. They are all designed for inflicting *direct* wounds, while cannon shot are also intended to be sources of *indirect* wounding. Fragments of stone chipped from parapets, splinters of wood and pieces of iron forced from platforms and gun-carriages, frequently create as much havoc as point-blank shots. A shell is generally so directed that the fragments may inflict more damage than the missile in its direct range.

FIG. 18.



Musket Ball; Needle Gun; Chassepot; Springfield.

Gun-shot wounds are frequently complicated by the entrance of extraneous bodies of various kinds, as bits of cloth, buttons, and the contents of the pockets of the person injured. Although such foreign substances do not of themselves inflict the wound, they may have an important bearing on the progress of cure. Gun-shot wounds will not heal and continue permanently closed as long as a piece of cloth remains in the track of the bullet.

Wounds produced by the direct action of cannon balls, and huge bolts projected from siege guns, are from the size and weight of the projectiles, usually extensive and rapidly fatal. Grape-shot, canister, and the elongated missiles of the mitrailleuse, inflict wounds of a grave character, the parts hit being severely torn and crushed. As a rule, the smaller the missile the less the danger, though a rifle bullet passing through vital parts is as fatal as a cannon ball. Bird-shot rarely penetrate deep enough to do serious mischief, yet at close range they may enter the body in a close group or as a compact mass, and inflict a destructive wound. Buck-shot may traverse the arm or leg, and dangerously wound the large arteries, veins, and nerves—they rarely break a bone. A pistol bullet is apt to lodge, especially if a bone impede its course. The aponeuroses, dense fascias, and thick tendons of the body either arrest the progress of pistol balls or deflect them from their course.

A round ball fired from the old smooth-bore musket is lighter, moves slower, and is more likely to be swerved from its course than the heavier, more swiftly moving, and revolving conical shot fired from a grooved rifle. The course of the latter is straight through the part of the body hit, therefore it may be estimated that everything in its way has been perforated or shattered. A spherical bullet moving at a lower rate of speed, may perforate the skin on one side of the thigh, strike the fascia lata, and after glancing in a semicircular course, emerge at a point opposite the wound of entrance. In such an event the bone, great vessels, and important nerves would escape uninjured.

Bullets are often deflected in their course after striking the body. A boy came under my professional charge who received a pistol shot near the top of the sternum; the ball glanced and following the border of the sterno-cleido-mastoid muscle, lodged against the base of the skull. The track of the bullet was traced by a welt and discolored line, and bubbly blood could be pressed from the entire course the bullet had passed. A young man received a pistol bullet in the region of the umbilicus; the track of the ball could be traced to the right pubic bone where the missile lodged. Another young man received a pistol shot over the eighth rib on the left side; the bullet followed the rib and lodged against a vertebra. None of these balls were extracted; and several years having now passed since the wounds were inflicted, it is likely the bullets have become encapsuled, and will never create any disturbance. A man was wounded in the calf of the leg by a musket ball; the track of the missile could not be traced, but pain and irritation in the tibio-tarsal articulation led to the discovery and extraction of the bullet. A man sixty years of age became tired of life, and shot himself with a pistol; the ball entered the scalp above the ear, glanced upon the cranium and lodged behind the opposite ear. I made an incision and removed the missile. These cases in my own practice represent marked deflection in the course of bullets. More striking cases are reported; a blacksmith put a gun barrel which he did not know to be loaded, into a fire to heat it, when the piece went off and the ball which it contained struck upon his leather apron, over the belly, penetrated the apron, the clothes, and the skin, followed round the course of the external oblique muscles of the abdomen, and was lodged beneath the scapula. Hennen relates a case in which a soldier was struck by a bullet upon the pomum Adami; and after the missile passed entirely around the neck, it came out at the wound of entrance. This is the most remarkable case yet recorded. As has been indicated, such extraordinary deviations from a straight line are hardly possible for heavy bullets having great velocity.

A projectile hurled with great speed cuts its way in the animal tissues, with a devitalizing tendency which reaches into the structures at some distance from the track of the missile; consequently sloughs of a dangerous nature not unfrequently present themselves along the pathway of bullets.

The density of missiles has a bearing upon the extent of perforation. A leaden bullet cast in moulds is softer and lighter than a similar projectile greatly compressed in the process of manufacture. The denser shot does not so readily flatten, consequently it penetrates the deeper structures of the body without having its course altered or its shape changed.

During the recent American war the number of killed and wounded gradually increased as improvements in firearms were introduced. A round ball discharged from a smooth-bore musket rarely inflicts but one wound, while a conical bullet fired from a Springfield rifle may kill and maim several soldiers before its force is spent.

Sometimes internal organs are severely injured by the remaining force of what are denominated "spent balls," and no external marks indicate the effects of a missile. Injuries of this kind were once supposed to have occurred from the "windage" of a swiftly passing projectile, or from aerial percussion. Soldiers are sometimes found dead on the battle-field, yet their bodies present no outward marks of violence. An important viscus of the abdominal cavity has been ruptured without there being an external sign of wounding. Dangerous and even fatal cerebral concussion has happened when no lesion of scalp or skull could be detected; and the bones of the limbs have been comminuted without the integument bearing marks of injury. The difficulty of reconciling such facts with ordinary ideas respecting the manner in which lesions are inflicted, led to vague theories in regard to the source of harm. It was conjectured that masses of metal hurled with great velocity might drive the air forcibly against the part injured; or, again, that a momentary vacuum might be created by the flight of the missile, and the rush of air to fill the blank might be the cause of the hurt. Finally, electrical changes developed by the swiftly moving missile, were cited to explain the origin of these mysterious lesions. But all such wild speculations have been abandoned, and a more rational explanation has been offered to account for "wind contusions." The fact that cannon balls under great velocity may pass close to various parts of the body, without inflicting the slightest harm, led to a sensible solution of the question. It has been frequently observed that portions of uniform, accoutrements, and pieces of wearing apparel might be carried away by the largest shot and shell without injury to the soldier himself. The hair of the head has been clipped close to the scalp, and no injury to the head inflicted. The tips of the ears and nose have been shot away without additional mischief. But a cannon ball may strike the body at a degree of obliquity which will not wound the skin, yet cause the integument and subcutaneous textures to spring inwards sufficiently to rupture a viscus or break a bone. Sir Gilbert Blane mentions two instances in which men were killed by the passage of cannon balls across the epigastrium without wounding the skin, yet viscera beneath were forced against the vertebral column and thus lacerated. The elasticity of the skin allowed the impinging missile to pass without inflicting an observable contusion, while more friable parts beneath broke under the pressure. A ricochet shot might rise or stoop just enough to fracture an arm, and not impart a tegumentary lesion. It is known that nearly spent balls leave the straight direction, and from atmospheric resistance and gravitation, terminate their flight in undulatory curves, therefore it would not be unreasonable to suppose that such missiles might inflict injuries to the deeper parts of the body, and leave the skin unharmed. There is no question but a kick upon the abdomen may rupture the liver, and not show discoloration of the integument; and a spent ball might inflict a similar injury without necessarily producing a wound of the skin.

When a person in a state of excitement is hit by a bullet, he may not appreciate the nature of the injury, but feeling a stinging sensation he may imagine he has been hit with a stick or cane; but if expecting a bullet wound, as in a duel, the shock may be quite prostrating, though the injury be not dangerous to life. A bullet wound of any of the viscera of the body is generally followed by a sudden loss of strength, ghastly pallor, and great mental depression.

The prognosis of gun-shot wounds depends much upon the parts injured and the magnitude of the lesion. A bullet wound of the brain is commonly fatal, though occasional recoveries are reported. If a ball pass clear through the head, the danger to life is somewhat less than when the missile lodges inside the skull. In Eve's *Remarkable Cases in Surgery* is collected the account of an iron breech-pin which remained in the cranium twenty-six days, and was then removed without a fatal issue. By the bursting of a gun the missile was driven through the os frontis just above the centre of the left superciliary ridge. The aperture discharged blood, and a tablespoonful of brain. The sight of the left eye was lost, and never recovered. The patient was deprived of consciousness only for a short time, and manifested no very serious symptoms either mentally or physically. On the twenty-fifth day after the reception of the injury, the foreign body appeared in the wound, and the next day was removed by the aid of the trephine, elevator, and forceps. The breech-pin was three inches long, and weighed three ounces. The recovery, except in regard to the left eye, was complete and permanent. The "Warren Museum" in Boston contains the skull of a man who, while engaged in blasting rocks, had a tamping iron three feet in length and weighing thirteen pounds, driven through his head by the premature discharge of powder. The bar, after traversing the head from the base to the top, was projected high in the air, and falling at a distance of some rods was picked up smeared with blood and brain. The patient, after being carried three quarters of a mile in an ox-cart, got out with some assistance, and entered the house. Two hours afterward, when seen by a physician (Dr. Harlow), he was quite conscious and collected in his mind, but considerably exhausted by profuse hemorrhage from the top of the head. The scalp was found everted, the skull extensively fractured and upraised, and the brain protruding. In front of the angle of the lower jaw, upon the left side, was a linear wound through which the bar, pointed end foremost, had entered. The sight of the left eye was destroyed. The patient, after experiencing severe symptoms for several days, at length began to convalesce; and in seven weeks after the accident he went home. A year afterwards he was in good bodily condition, but irritable and vacillating in mind, and very profane, though not so before receiving the injury. The attention he received on the part of physicians and others, led him to believe he was a fit subject for exhibition, consequently he took his bar and wandered from city to city, and at length reached Chili, South America, where he earned a living by driving a six horse stage-coach. In 1860, twelve years after the accident, he went to California where he engaged in farming. While thus employed he was seized with convulsions, after a series of which he died. Although the case was reported in the *Boston Medical and Surgical Journal*, and fully authenticated, many surgeons remained skeptical in regard to the extent of the injury until the skull was obtained and placed where it could be examined by the incredulous.

The Army Medical Museum, at Washington, D. C., contains several specimens which clearly indicate recovery after gun-shot wounds of the skull and perforation of the cerebral mass. In some cases trephining had been performed; and the history of the cases shows that the practice, in some instances, must have prolonged life, and promoted recovery in others.

Gun-shot wounds of the face and neck are generally serious, and often dangerous through liability to hemorrhage. As has been stated, the track of a ball is disposed to slough, consequently bullet-wounds in vascular regions are liable to secondary hemorrhage. Then, again, the face and neck are the seats of highly organized structures, and important functions, therefore gun-shot wounds of these parts are apt to be attended with serious inconveniences. Interference with respiration and deglutition, if considerable, is dangerous to life.

Gun-shot wounds of the spine are similar in their effects to those of the head. The spinal cord is subject to concussion, compression, and laceration. Fragments of bone pressing upon the vertebral nerves often call out dangerous effusions, and excite inflammatory action in the meninges of the cord. However, a bullet may completely perforate the body of a vertebra and leave the cord untouched. When the spinal cord is lacerated or compressed, nothing less than paralysis of all parts of the body below the seat of injury need be expected, though an occasional recovery, with functions unimpaired, has been reported.

Gun-shot wounds of the chest are frequent and dangerous. In battle that part of the body is especially exposed; and in personal encounters, whether duels or street fights, the thorax is a target for combatants. When the cavity of the chest is not penetrated, the peril is not great, but wounds of the heart, lungs, and important thoracic vessels, are either immediately fatal, or the danger is imminent. The hazard consists in shock, hemorrhage, dyspnœa, and pneumonia. The fragments of a broken rib forced into the viscera of the thorax, place the victim's life in jeopardy.

When a bullet makes a clear passage through the lungs, and does not injure the heart or the larger vessels, the lesion frequently fails to produce death. A ball may lodge in the pulmonary parenchyma, become encysted, and at length cease to be troublesome.

Extravasations of blood into the pleural cavities are commonly followed by threatening symptoms. The pain, a sense of suffocation, and constitutional disturbance, are grave complications which prove quite intractable. Perforations of the thoracic parietes and lung structures are liable to be attended with emphysema, which is alarming if not dangerous.

A bullet wound of the heart is almost certain to prove fatal, though patients have survived such lesions for days and weeks; and recovery is not impossible. Dupuytren, in his *Lectures on Gun-shot Wounds*, reports a case in which a fragment of fractured sternum was forced into the right ventricle of the heart, yet the patient lived until the twelfth day.

In 1855, Bill Poole, of New York, a noted pugilist, was shot by some ruffians in a saloon. One bullet hit him in the right thigh, and another penetrated the heart. The latter shot was fired while he was prostrate; but he sprang to his feet, and reeling fell again to the floor. He became senseless, cold, almost pulseless, and apparently moribund, for about four hours. From this condition he rallied, and became so free from the usual symptoms of severe injury, that his medical adviser, Dr. Putnam, considered that the ball had really not penetrated the thoracic cavity, and sent for Prof. J. M. Carnochan to corroborate or dispel the favorable view of the case. The consulting surgeon found no symptoms of a heart-wound, and was disposed to look hopefully upon the case. For several days the pulse continued from eighty to ninety, the skin was moist, there was no hemorrhage from the wound, and no sharp pains were suffered. On the eighth day the patient shook hands and conversed with more than a hundred visitors, which made him tired and irritable; and on the ninth and tenth days it became apparent that danger threatened; he became restless, anxious, and feverish, and on the eleventh day he sank and died. An autopsy revealed the fact that a bullet had lodged in the septum between the ventricles. The track of the ball in the heart was filled with firm plastic exudations, and the missile itself was encased in a delicate cyst. The wound in the pericardium and in the surface of the heart had healed and cicatrized. This is considered one of the most remarkable cases of heart-wound that has ever been reported. Nothing approaching it occurred on either side in the late American war.

Dr. Purple, in his monograph on "Wounds of the Heart," reports a case in which a man was known to have lived six years after a ball had penetrated the heart; and another man lived ten weeks with a musket ball in his left ventricle.

In 1840, at Chatham Four Corners, Columbia Co., N. Y., John Kelley, fourteen years of age, while in bed, received a bullet wound in the shoulder. The ball had been fired at a target, and accidentally hit the lad. No unfavorable symptoms attended the injury, and the missile was presumed to have lodged somewhere about the shoulder. In six weeks the patient was able to resume work. In 1845 he suffered an attack of pneumonia, during which the heart was for the first time noticed to be in a tumultuous state; and cardiac symptoms continued until death, which occurred twenty years after the reception of the bullet. An autopsy was held to discover the location of the projectile. To the surprise of those who conducted the examination, the missile was found encysted in the walls of the heart near the bottom of the right ventricle. The bullet, in this strange case, was supposed to have entered a large vein at the root of the neck, and gradually found its way into the heart, where, becoming entangled in the muscular columns, it found a resting place, and at length got encased in a neoplastic sac. The heart containing the ball is now in the Museum of the Bellevue Hospital Medical College.

Gun-shot wounds of the abdomen, like those of the chest, are frequent and grave, if the viscera of the region be reached. Death may occur from the shock, from extravasations of blood, and from peritonitis following the discharge of fecal matter into the peritoneal cavity. Works on Military Surgery contain reports of recovery after perforation of the stomach, small intestines, liver, spleen, kidneys, and bladder, yet such cases, when compared with the immense proportion which terminate fatally, must be regarded in the light of exceptions. Dr. Beaumont had under his charge a soldier who survived a gun-shot wound of the stomach, a fistulous opening through the side continuing for years, or as long as the patient lived. I once had professional charge of a man who received two penetrating bullet wounds of the abdomen. The intestines were perforated, and fecal matter was discharged through the fistulous tracks for six months or more. The apertures gradually closed, and the patient fully recovered. The bullets were never extracted, and their location remains a mystery. Dr. Emmet reports the case of a young woman who had the vesico-vaginal septum perforated by a bullet accidentally discharged from a navy revolver which fell to the floor and went off, muzzle upwards. The patient recovered, but with a vesico-vaginal fistula which was finally closed at the Woman's Hospital in New York, after several unsuccessful operations.

Gun-shot wounds of the extremities of the body may be serious or trifling, the prognosis depending much upon the structures injured. Lesions of the integument and even of the muscles, may be unimportant, yet there is always more or less danger from tetanus, erysipelas, and other incidental complications. The shattering of large bones, the penetration of the larger articulations, and the laceration of important blood vessels and nerves, constitute lesions which are usually attended with grave symptoms. The bursting of a pistol in the hand is a common accident; and one which may be followed by shock, tetanus, sloughing, septicæmia, and distortion through cicatrization and morbid contraction of the tendons. Gun-shot fractures of the long bones are frequently followed by necrosis and osteo-myelitis.

If it were not for the presence of a foreign body in gun-shot wounds, the traumatic state would not require a course of treatment which differed essentially from that usually followed in the management of contused, lacerated, and penetrating wounds produced by other causes. Hemorrhage when considerable, is of sufficient importance to command the earliest attentions of the surgeon. As in other wounds, the bleeding may cease in a few minutes through the influence of nervous depression, syncope, coagulation of blood in the wound, and the usual contraction and retraction of the mouths of the lacerated vessels. Sometimes the patient has the self-possession and competence to apply efficient means for arresting the flow of blood—he may stop a bleeding orifice with his finger, or press upon the main artery above. An acquaintance of mine who had the profunda femoris severed by a pistol-shot, compressed the femoral beneath Poupart's ligament by the application of his two thumbs. He controlled the hemorrhage for an hour, when a horse-shoe tourniquet was made to arrest the flow of blood until the severed artery could be ligated. With less knowledge and presence of mind the patient would have lost his life.

During our late war soldiers were often instructed to use tourniquets, but it is a question whether any lives were saved by the practice. If the patient does not know where the arteries are located, he would not be likely to arrest the flow of blood by compression. More harm than good is generally sustained by the unprofessional use of cords or bands tied around a bleeding limb. Such a course usually increases a venous hemorrhage.

When a wound that has bled profusely, has ceased to bleed, it is generally best not to disturb the coagula by probing and other meddlesome treatment, lest a fresh flow of blood be provoked. As the immediate danger is from hemorrhage, and not from the presence of the missile, the wound is not to be disturbed. The "shock" is the next condition to engage the surgeon's attention. Sometimes this is profound and dangerous. When a bone is shattered, a limb mutilated or entirely carried away, a cavity of the body penetrated, or a viscus perforated, great mental depression and nervous agitation ensue. The patient grows suddenly pallid, trembles, totters, complains of feeling faint, and perhaps vomits. After which he is bathed in a cold perspiration, and his general features express anxiety and despair. If the wound be not severe, a state of reaction soon occurs, especially if the patient be encouraged, and induced to swallow a stimulant. The inhalation of a small quantity of chloroform will quickly dispel the shock of an unimportant injury. But if the wound be mortal, the nervous depression can not be overcome, and death seems to occur from the persistence of the shock. However, an attempt should be made, even in unpromising cases, to bring about reaction; and if only partial success attend the effort, a duty has been performed. Artificial heat can be applied to the extremities; and if the patient can not swallow hot and stimulating drinks, he can be made to inhale the vapor of chloroform until a state approaching anæsthesia is produced.

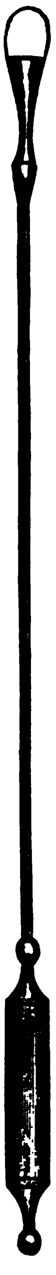
After a patient who has received a gun-shot wound, is in comfortable quarters, and the shock is overcome, the missile, if one is supposed to have lodged in the body, should be sought, and removed if practicable. But it is not always easy, or even possible, to find a bullet which has entered the body, and probably lodged. In a scrimmage several balls may have been received, one lodging and others going clear through an arm or leg, and finally entering the trunk or escaping altogether. As has been stated, the wounds of entrance and exit are not always so distinctive that their character can be determined by inspection, therefore the number of shots received can not be decided by the wounds inflicted. Dupuytren reports a case in which the ball split against the spine of the tibia, and after traversing the calf of the leg in two directions, entered the other leg at two points—one bullet thus causing five orifices. John Hunter mentions the case of a young gentleman who was shot through the abdomen by means of a musket loaded with three balls. In this instance there were only two orifices of entrance and two of exit, one ball having followed in the track of one of the others; "that there were three that went through him was evident, for they afterward made three holes in the wainscot behind him, but two very near each other." If it had not been for this circumstance, it might have been suspected that one ball had lodged in the body, if it were known that three balls were in the musket, for one bullet might have left the course of one of the others while in the body as well as after going through the trunk.

When a bullet has traversed a part of the body, making a wound of entrance and exit, and, of course, not lodging, the track of the missile should not be traced with probes unless there be grounds for suspecting that a piece of clothing or other foreign substance has been carried into the wound and there left; and even then the probabilities are that the caught and impacted fabric would escape detection. If only one orifice has been made by a ball, the presumption is that the missile has lodged somewhere in the wound, and search must be made for it accordingly.

Probes of various lengths, sizes and qualities, are employed in the exploration of bullet wounds; but of all instruments for conducting an examination the finger of the surgeon is the most reliable and efficient. If the wound in the integument be not large enough for the easy entrance of the finger there is no valid objection to enlarging the orifice with a knife. A moderate incision will not prolong the period of cure. As soon as the finger is inside the tegumentary structure, it may be moved about in the flesh with great freedom; generally the course of the ball can be traced with the finger when a probe would fail to follow the track. Then, again, the finger might discover pieces of cloth and fragments of bone, that a probe would pass by or fail to touch.

The common silver probe of the pocket-case is not long enough to reach the bottom of a deep wound, therefore an exploring instrument made on purpose for probing to the depth of ten or twelve inches finds a place in well assorted cases of surgical instruments. Probes may be made of whale-bone or metallic substances; a bougie may be employed to follow the course of a bullet in a deeply penetrating wound. A pencil of tough wood may be improvised to explore a gunshot wound. Dr. Gelish, of California, has suggested a probe whittled from white pine as an instrument which will bring from the wound the mark of lead in the event it touches the bullet. Nelaton ingeniously constructed a probe with a porcelain bulb or tip for ascertaining whether the exploring instrument has touched a metallic missile or a bone. With this inplement the bullet in the heel of Garibaldi was discovered. When the bulb of porcelain comes in contact with a leaden ball it receives a delicate impression

FIG. 19.

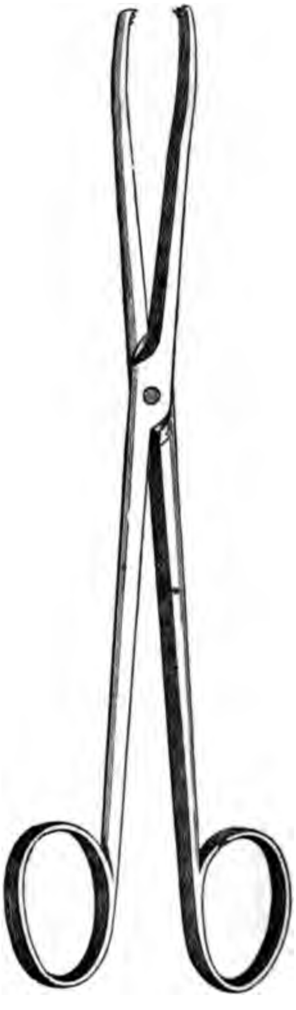


Nelaton's probe

which remains after blood and other fluids are washed off; but the mark of lead can readily be removed with soap and water, so that the instrument is not impaired for future explorations.

When the location of a bullet is discovered, the question of removal is to be considered. As has been intimated, balls made of pure lead may become encysted, and never offer the least trouble; but such cases are exceptional, and the rule is that sooner or later they prove annoying. If a bullet lodges near the skin, after traveling a considerable distance in the flesh, the safest and most expeditious course is to cut down upon the missile and remove it through the incision. In the removal of a bullet its position in relation to important blood vessels and nerves should be considered. It may be better to make a deep incision on the side of a limb having no large vessels, than to meddle with a wound in dangerous locations. A ball may have safely passed through the axilla anteriorly and lodged beneath the scapula, so that it would be safer to make a deep wound behind the armpit, than to attempt extraction of the missile through the orifice of entrance.

FIG 20.



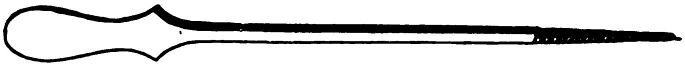
Toothed bullet forceps.

Various instruments have been invented for removing bullets from wounds. Some of them appear to be very ingeniously constructed, yet few work well in practice. Instruments with blades, as common bullet forceps, present the objection that they necessitate the dilatation of the wound in order to grasp the bullet. To obviate this objection forceps have been made with short and sharp teeth, so that only the slope of the missile has to be grasped in order to make the grip secure. In the use of such forceps care must be exercised or a nerve or vessel may be lacerated by the teeth of the instrument.

When a ball has lodged in a bone, forceps can not always be used to advantage, and a bullet-screw operates more satisfactorily, the missile being fixed so as to permit the employment of such an instrument. However, if the bone is little more than subcutaneous, a lever, elevator, narrow chisel, or other kindred implement may prove to be superior to the bullet-screw. Sometimes gouge-forceps can be employed advantageously to remove a thin layer of bone on the side of the ball, to favor dislodgment.

The orifice of a bullet wound should never be closed, but so dressed as to favor drainage, or the discharge of fluids and foreign bodies that may be attempting to escape. Closure of the wound would imprison coagula and other substances that ought to be discharged. I have known a severe chill and other unpleasant symptoms follow the application of adhesive strips and bandages to the orifices of bullet wounds. It is generally good practice to dress penetrating wounds of all kinds with poultices, fomentations, or packs of wet lint. Lacerated wounds may require sutures, adhesive strips and bandages.

FIG. 21.



Bullet Screw.

Gun-shot wounds are frequently attended with severe pain, therefore anodynes should be judiciously employed. A solution of morphia or chloral, or the two in combination, should be prescribed, and directions given that the medicine be administered according to the urgencies of the case.

When bones are broken the fracture is generally compound, and frequently comminuted, therefore the injury should be treated with circumspection and assiduous attention; and the reparative process will necessarily be tedious. Gun-shot wounds of the limbs, complicated with penetration of joints or comminution of the bones, often necessitate amputation sooner or later; and if such an operation has to be performed, the quicker it is done the better.

The constitutional treatment to be adopted in the management of gun-shot wounds is not essentially different from that followed in the management of any important surgical lesion. At first a febrifuge may be needed; and iron, mineral acids, and quinia, during the suppurative and recuperative stages. The diet should be light at first, then nutritious and sustaining.

Gun-shot wounds of the head are to be managed with great caution. A simple lesion of the scalp could not ordinarily be considered serious, yet the bullet inflicting the wound may have struck heavily upon the skull, producing concussion of the brain, or fracture of the inner table, with compression as a sequence. If a bullet has entered the cranial cavity, or passed through it, little can be done except remove spicula of bone, and relieve compression of the brain. If it be known where the bullet rests, the trephine may be used to make way for removal of the missile. Explorations with the probe should be conducted cautiously. In a case that came under my observation, a bullet fractured the skull, and then glanced and lodged in the lining of the cap worn at the time of the shooting. The surgeons called to treat the case discovered a depressed fracture of the skull, and trephined to relieve the compression. This may have been well enough, but they injudiciously probed the brain in search of the bullet. The assailant was tried for murder, but escaped conviction on the ground that the probing, as claimed by the defense, may have caused the death of the victim. Protrusion of the brain—hernia cerebri—may be sliced off, but should not be subjected to pressure with the idea of forcing the protruding mass back into the skull. Compresses of lint, wetted in carbolated water, may be used upon gun-shot wounds of the head, whether the skull be perforated or not.

In gun-shot wounds of the face and neck, the treatment is much the same it would be for injuries in general. The hemorrhage, if dangerous, and not controllable with styptics, compresses and plugging, is to be arrested by ligating the carotids, or other arteries implicated in the bleeding. When the face is considerably mutilated, a plastic operation may be ueeded to screen the deformity. Orifices leading into the pharynx, larynx and trachea, should not be closed, but left to the recuperative forces of the organism. An opening leading into the air passages might be followed by emphysema, especially if the external orifice be closed artificially. Lesions of the œsophagus are apt to be followed by strictures of the tube, and difficulty of deglutition.

The treatment for gun-shot wounds of the chest is substantially the same as that which may be useful in penetrating wounds of the thorax. Rarely can the missile be safely removed; and death or recovery depends much upon the nature of the injury. In perforating wounds of the lungs, there seems to be no better remedy than veratrum to quiet any sympathetic agitation of the heart, and to favor respiratory action. Fragments of ribs driven into the lungs should be removed if possible, and efforts made to obviate extensive emphysema. Pressure around the external orifice may prevent the cellular tissue from filling with air, and punctures of the integument will give imprisoned air a chance to escape.

In cases where the hemorrhage from a chest-wound is profuse, it is best to close the orifice; also when the patient can breathe easier by having the opening plugged. The closing of the wound is to gain a temporary advantage. In the course of a day or two the wound should be allowed to discharge whatever fluids accumulate, and have no other avenue of escape. Hernia of the lung through an orifice made by a bullet is not common, yet occasionally occurs. The protruding mass is generally to be left to the operations of nature, for surgical interference may prove injurious.

A troublesome cough which often attends chest-wounds, is generally mitigated by the judicious use of morphia. The twentieth of a grain placed upon the tongue every hour or two, is a dose of sufficient size to allay the pulmonary irritation. If pain be great, large doses of chloral may be administered, or morphia hypodermically.

In the management of gun-shot wounds of the abdomen, the object of the treatment is to avoid fatal peritonitis. It is generally useless to seek for the missile when it has entered the abdominal cavity; if it has perforated the intestines the discharge of fecal matter upon the peritoneal surfaces is more harmful than the presence of a bullet. Hemorrhage can not be arrested when profuse, but some way should be provided for its escape from the peritoneal cavity. I am in favor of making an incision in the lower region of the abdomen, through which coagula, fecal matter, and fluids of various kinds may escape. Drainage is needed in penetrating wounds of the abdominal cavity, or blood and effusions of serum will become toxic, and destroy life through septicæmia.

When a wound in an intestine can be closed with sutures, the operation should be performed, fine wire of virgin silver being used for sewing up the rent. But it is not often the intestinal wound can be reached unless an incision is made in the abdominal parietes, a procedure which is justifiable in some cases.

It is fortunate that fecal fistulæ will, in the course of time, close without surgical aid. The only course that seems to favor the closure is a diet which furnishes as little fecal waste as possible. Milk, eggs, animal broths, vegetable jellies, and like nutrients, are of that class. In obstinate cases plastic operations may serve to close the fistulous openings.

Recoveries after bullet wounds of the bladder have been reported. The danger consists essentially in urinary infiltration. Fistulous channels established by the passage of a bullet may continue for months or even years, but they generally close at last without surgical interference. Missiles lodging in the bladder, and originating calculi, are to be removed by the ordinary lithotomy operation. As soon as a bullet-wound of the bladder has occurred, a catheter should be introduced through the urethra, and kept there for a week, except a daily removal to cleanse the instrument.

When nerves are severely injured by the passage of a bullet, a troublesome paralysis follows. This may gradually grow less, yet there are plenty of instances in which no improvement is appreciable, though galvanism, the hypodermic use of strychnia, and other agencies in reputable use be faithfully employed.

A painful state of the nerves following gun-shot injuries can generally be relieved by the hypodermic introduction of chloroform, a few drops being injected at a time. The sensation produced by the presence of the anæsthetic is not pleasant at first, but the stinging impression soon passes off, and a lack of feeling follows, which is compared to that attending the section of a nerve.

The local application of liniments does little towards allaying the pain attendant upon a lacerated or compressed nerve. In rare cases it may be necessary to cut down upon an irritated nerve, and remove the cause, even if a segment of the nerve has to be excised.

TETANUS.

A disease characterized by prolonged and uncontrollable spasm of the voluntary muscles is denominated tetanus—a term which by derivation signifies to stretch or convulse. In common language it is called "lock-jaw," from the fact that the jaws are rigidly set, the muscles which close the inferior maxillary being too powerful for the slender muscles beneath the chin which open the mouth.

Tetanus generally arises from an irritating wound of the hands or feet, and is then termed *traumatic*, to distinguish it from the *idiopathic* form which springs from causes neither visible nor apparent. Probably both varieties come from irritation of nerves or nerve-centres. Emanating from whatever source, the spasm is that of rigid muscular contraction, without intervals of complete relaxation, except in the last stage of the disease when approaching dissolution has overcome the centres of irritability. During the progress of tetanus there may be periods in which the spasmodic action yields so far as to encourage hope of a cure, but a violent return of the spasm soon dissipates every favorable indication. Not unfrequently a paroxysm subsides sufficiently to allow the patient to eat, drink, sleep, and move with comparative comfort; yet, as just stated, the relaxation is not perfect in every muscle, but an appreciable degree of rigidity remains in some group of muscles.

In what is called idiopathic tetanus the paroxysms may be slight and intermitting, allowing the victim to enjoy seasons of repose, and to live long enough to give the disease a *chronic* character, as distinguished from the *acute* form which follows injuries. Idiopathic tetanus occasionally terminates in recovery. Acute tetanus is the typical form of the disease; and a chronic state is a deviation from the true type, and not a distinct variety of the affection.

Unfortunately tetanus presents no premonitory symptoms which can be relied upon as warning signs of the terrible onset. To be sure, there may be an uneasy and irritable state of a wound, and the patient may experience rigors, febrile symptoms, and sleeplessness, but as these morbid phenomena are common attendants of other diseases, there is nothing in any one of them to warrant a well grounded suspicion that a paroxysm of tetanus is about to take place. A stiffness of the muscles of the neck and jaw is the most reliable premonitory symptom of tetanic onset; and there is not a period of complete relaxation. Mr. Morgan, in a published lecture on tetanus, gives the following graphic description of the introduction, progress, and termination of the disease: "The first *decided* symptoms will almost invariably be an uneasy sensation and stiffness in the muscles of the lower jaw and tongue, which does not, however, in the first instance, amount to actual pain, unless the parts are a good deal moved about, and generally about the same time *stiffness is observed in the back of the neck.* Thus the first complaint of your patient will often be, 'that he has taken a cold, and is suffering from *a sore throat and stiff neck;*' and, therefore, unless the friends and attendants are made acquainted with the importance of keeping a strict watch for the occurrence of these symptoms, and the necessity for an immediate application of remedies, they will be attributed to a wrong cause; and thus the disease will be gradually gaining ground till the only hope of safety is gone, for the sole chance of recovery from the use of remedies depends upon their early application. Some have complained of a violent pain under the sternum as a concomitant symptom.

"As the disease proceeds in its course, the patient complains of *difficulty and pain in masticating and swallowing his food;* the lower jaw soon becomes completely fixed and closed, and with every effort to open the mouth, the pain, which is now continued and severe, is increased to agony. In this early stage you will usually find that the muscles connecting the head and neck with the body are affected, and that the concomitant symptoms are languor, debility, and either complete or incomplete bending of the body backwards.

"The next symptoms will be a convulsive cramp in all the affected muscles, brought on by an attempt to swallow; and the very idea of being obliged to make such an effort excites an expression of horror and distress in the countenance. Sometimes in the early, and more rarely in the advanced, stage of tetanus, the stomach will be sympathetically affected, and, in consequence of this, nausea and vomiting will occasionally occur.

"The next constant symptom will be a *sudden, violent, and continued pain,* increased at short intervals by spasm extending from the scrobiculus cordis to the spine, in the situation of the diaphragm.

"Shortly after this symptom has shown itself, the *abdominal muscles* will be constricted and hardened by tetanic cramp; and the contraction of these parts is so permanent and violent, that, on pressing upon the abdomen, the muscular fibres convey to the hand the sensation of a hard board beneath the skin, rather than that of living animal matter.

"In the course of time all the voluntary muscles partake more or less in the disease. The head is thrown back and fixed by the powerful contraction of the extensor muscles of the neck. The extremities likewise become fixed and rigid. The shoulders are drawn forward by the pectoral and deltoid muscles; and the arms are either stretched out or fixed in a parallel line with the trunk, or drawn across the abdomen. The lower extremities are almost invariably in a straight position, and consequently in a line with the body. But notwithstanding the continued and powerful contraction of muscular fibre in the limbs, it will be found that the wrists and fingers are but little affected; the ankles and toes, however, suffer occasionally from the effects of the disease.

"At this period of the complaint the *countenance* is pale, anxious, and contracted, and is disfigured by the perverted action of the muscles, producing what is termed 'the tetanic grin.' The spasms now become more violent and more frequent, and during their continuance and immediately after them the respiration is hurried and laborious; but in exceptional cases it may be easy, and performed by the abdominal muscles. While the spasmodic paroxysm lasts *the pulse* is generally quick, small, fluttering, and irregular; but during the intervals both the pulse and respiration are comparatively tranquil.

"In some cases the spasm becomes so violent that the assistance of an attendant is necessary, during the paroxysm of a cramp, to prevent the patient from being projected out of his bed. In other cases, again, the spasms are less sudden, though equally strong and painful, and consequently, instead of that jerking contraction of the muscles, the body is more gradually raised from the bed, and if the muscles at the back of the neck and trunk and those of the lower extremities are the parts most powerfully affected, then it often happens that the body at intervals is drawn into the form of a bow, and in the recumbent position the occiput and heels rest solely on the bed, whilst the lower limbs and trunk curve upward to form a complete arch.

"It will frequently happen that, in consequence of the continued contraction of the sphincter muscles of the bladder, retention of urine takes place, and priapism will occasionally occur as a concomitant symptom.

"The bowels are in most cases obstinately constipated, and the large intestines loaded with offensive scybalous matter.

"The *secretion of urine* varies, but it is rarely very profuse.

"Towards the termination of the disease, the torture of the last attack of spasm, and the apprehension of the near approach of another paroxysm produce an expression of dreadful mental distress and anguish in the countenance. The sufferings are only to be soothed by perfect rest and quietude; the slightest attempt at motion immediately brings on a new attack of spasm; the opening of a door, or the waving of the bed-curtains, will throw the patient into convulsions, and even the sound of that voice which, on other occasions, might have soothed and smoothed the path of anguish and of sorrow to the grave, will now only add increased agony to the intense suffering. Every sound, every moving object in the room is fuel added to the fire which is consuming the life of the tortured victim.

"At the close of life the whole face becomes distorted and disfigured, and the larynx forcibly drawn upwards; the spasm in the muscles depressing the lower jaw, now and then alternates for a moment in severity with that by which their antagonists are affected, and thus for a moment an aperture is left between the jaws through which the tongue is instantly pushed and lacerated by the sudden closure of the teeth upon it. If a large portion of the organ should be thus wounded and strangulated, hemorrhage will immediately follow, and the countenance and even the bed-clothes will be bathed in blood, thus giving additional horror to a scene in which the extremes of mental agony and intense bodily suffering appeared to have done almost their utmost beforehand.

"In some cases the last moments will be comparatively tranquil, for exhaustion and delirium occasionally render the patient alike insensible to pain and to all that mental distress which was previously excited by apprehension and despair; but, in the majority of instances, the torture of a paroxysm of spasm terminates at once the sufferings and the life of a tetanic patient. The intellectual faculties remain unimpaired even to the last, and the senses are perfect, but sometimes rendered morbidly acute."

In a case of tetanus which came under my observation the features of the disease were horrible, but hardly as shocking as those depicted by Dr. Morgan. The patient was a young man who had his thumb shot off by the premature discharge of a pistol. The lacerated stump presented powder marks, shreds of flesh, and stringy tendons, which needed amputating to get rid of the bruised and torn structures, but the patient, a dissipated character, peremptorily refused to have anything more done than the application of pieces of cloth wet in whisky. On the second day he experienced a chill, and complained of "pain in his bones," as well as other disagreeable sensations. Opiates were freely administered, and the wound was re-dressed, but these attentions did not prevent a spasm of the muscles, and all the dire phenomena of tetanus. Under the influence of chloroform the rigid muscles relaxed; and he was thus enabled to swallow food and drinks. While anæsthetized he could sleep a few minutes at a time, and talk when he was awake. But upon the return of a severe paroxysm of pain and muscular spasm, even chloroform failed to completely subdue the convulsion. Enemas of asafœtida and lobelia were repeatedly administered, but without substantial effect; and the patient died from exhaustion on the fourth day.

When the spasm is confined to the muscles of the face and neck, holding the jaws in a clenched state, the local manifestation is called *trismus;* when the muscular spasm is general, and the body is bent backwards, which is the most common form for the disease to take, the variety is denominated *opisthotonos;* and when the spasm is general and the body is bent forward, which is a rare phase of the affection, the condition is designated by the term *emprosthotonos.* In the latter form of the disease, the head is brought in contact with the knees, the body being rolled into a ball, like that of a sleeping porcupine. *Pleurosthotonos,* an exceedingly rare form of tetanic manifestation, is where the muscles on one side of the body are spasmodically contracted, and the spinal column is forcibly bent laterally. Authentic cases of this variety of tetanus are reported.

Trismus nascentium seu tetanus infantum is a form of disease peculiar to new-born infants, and occurs oftenest to the offspring of the colored races. The negro infants of the West Indies are frequently victims; the disease occasionally appears in the lying-in departments of hospitals, whites as well as blacks being attacked.

In cases of traumatic tetanus it will generally be found that a foreign body of some kind has been left in the wound. A girl running about in bare feet stepped upon a slender nail which penetrated the heel to the os calcis and broke, a small fragment remaining in the wound for weeks, when a tetanic spasm occurred, and the patient died in the course of a few days. The heel was cut into, after death, and the piece of iron discovered, though its presence was never suspected. Guy's Hospital Reports contain the account of a sailor who had his thumb transfixed with a splinter of teak-wood. The wound healed kindly, but in two months after the accident the patient died of tetanus. A dissection of the thumb revealed two pieces of splintered teak in the abductor muscle, and resting upon a branch of the radial nerve.

Tetanus may occur from the most trivial lesions. Records show that abraded, lacerated, incised, punctured, and gun-shot wounds, may be followed by tetanus; also burns, frost bites, fractures, dislocations, ligature of pile tumors, amputation, castration, the use of uterine sounds, and the performance of ordinary surgical operations. The commonest causes of tetanus are compound fractures, burns, and injuries of the hands and feet.

Idiopathic tetanus, though arising without apparent provocation, is undoubtedly the result of intestinal parasites, or of foreign bodies, as fragments of bone, swallowed with the food. The accumulation of bird-shot in the appendix vermiformis cœci of a man accustomed to eat much game, is reported as having caused a fatal attack of what was pronounced idiopathic tetanus before an autopsy was held.

Cold and dampness suddenly encountered by those who have recently received wounds, are fruitful agencies in the production of tetanus. Wounded soldiers who are exposed to cold winds and rains after the heat and fatigue of a battle, are especially liable to tetanic attacks. Many of the wounded marines on the frigate *Amazon*, during the war of 1812, in Charleston harbor, were affected with tetanus on the fourteenth day after receiving gun-shot injuries, the weather having suddenly changed from hot and dry, to cold and wet.

The Medical Bureau, at Washington, received reports, during our late war, of 363 cases of traumatic tetanus, twenty-seven of which recovered; and it is probable that some of the favorable cases were not genuine tetanus, as the symptoms depicted hardly conform to those of the well developed disease. I was once called to treat a Mr. Jones, on George Street, who was convulsive after having received a puncture of the left palm, a pitchfork tine being the implement inflicting the wound. The patient rode in a cold rain several hours after receiving the injury, and was all the time in terror of lock-jaw. When I saw him he was in a convulsive chill, and the muscles of his neck were rigid, but not more so than I have observed in hysterical patients. I did not believe the symptoms were those of tetanus, though they were strongly indicative of that disease. The patient was extremely nervous, and would have a paroxysm of agitation and muscular spasm every day for a week; then he began to feel that he might recover, and made an effort to resist the convulsive onsets. In a couple of weeks he reached a condition of health, though he always contended that he had experienced a bad attack of lock-jaw.

A lad who came under my observation sustained a puncture of the hand from the lateral thorn of a cat-fish, and died in convulsions on the second day. Some of the symptoms were those of tetanus, such as stiffness of the muscles of the face and neck, a sardonic grin, inability to swallow food or drinks, and muscular twitchings, but there were intervals of repose and relaxation, during which the lad could converse easily and swallow without pain or agitation. The fatal spasm was presumed to have held the glottis closed so long that suffocation took place.

The symptoms of poisoning from strychnia quite closely resemble those attending tetanus. In the famous case in which Dr. Palmer was accused of the murder of Cook by administering strychnia, several English physicians swore that the symptoms were those of tetanus; but in the same trial the fact was shown that the spasm produced by strychnia comes on quickly, without a prolonged stiffening of the muscles of the jaws and neck; that the poison affects the muscles of the trunk and limbs, and not those of the jaw, and that it convulses the wrists and fingers, which are parts of the organism not impressed in tetanus.

The symptoms of hydrophobia resemble those of tetanus, but with considerable difference after all. In rabies the mind is subject to terror and delusions; in tetanus the body is convulsed, but the mental faculties are comparatively calm. In a tetanic convulsion there is no dread of water, though the spasmodic muscles may not allow the sufferer to drink; in hydrophobia the sight of water provokes a convulsion.

The treatment of tetanus consists in removing the cause of irritation if possible. If a wound has been received, and is supposed to be the source of disturbance, it should be incised and explored for foreign substances. If no benefit be derived from such a course, the extremity should be amputated at once. In 1845, Mr. Key, of London, amputated a leg to get rid of tetanus which arose from an unreduced dislocation of the astragalus. The symptoms disappeared as soon as the operation was completed; and a dissection of the foot revealed the posterior tibial nerve put violently upon the stretch by the displaced astragalus. Tetanus is so often fatal when constitutional remedies are relied upon that even a dangerous operation which promises relief is justifiable. It is not probable that amputation of the wounded limb would cure a case of tetanus which had existed several days, the patient being reduced to death's door, but if timely performed the operation offers a rational hope of relief.

Cauterizing and fomenting a wound which has provoked tetanic spasms, will not accomplish much, though when amputation is impracticable, such instrumentalities are not to be despised and neglected. Hot and wet wrappings might diminish the irritation. Chloroform, locally applied, is another agent of great potency in the reduction of muscular spasm in any region of the body.

The internal use of Calabar bean, and woorara, have been extolled as specifics in the treatment of tetanus; but I know nothing of their influence upon the morbid state from personal experience. As a tetanic patient can rarely swallow, the agents should be employed hypodermically or in the wound. The bromide of ammonium in drachm doses when the medicine can be swallowed, and subcutaneously as well as *per anum*, when deglutition is impossible, is an agent of value. Indian hemp, lobelia, asafœtida, and antispasmodics generally, do not gain control over tetanic spasms. Chloral hydrate in large and oft repeated doses, is an efficient agent, and should be employed with confidence in the management of tetanus. It is consistent with reason, and confirmed by experience, that chloral is an invaluable remedy in the treatment of tetanus.

Ice bags applied to the spine have been recommended as potent to overcome tetanic spasms, but as the disease is not inflammatory, there being no undue heat, I would not infer that cold would be as efficient as searing the back with a hot smoothing iron. Besides, when the patient is coiling and contorting, the opportunity to apply ice persistently is not offered.

Strychnia produces symptoms which resemble those of tetanus, hence it has been suggested *contraria contrariis,* and *similia similibus curantur,* that nux and its allies, Calabar bean and woorara, were the proper remedies to overcome tetanic spasms, but an acute case of tetanus has not been saved by any of these agents. An Italian surgeon was the first to use woorara, and applied a solution of the poison to the wounded part in two cases of traumatic tetanus, both of which died. He used the agent in a doubtful or *chronic* case, and recovery ensued; but recoveries in chronic or idiopathic tetanus are reported, no active medication having been employed, consequently little reliance can be placed upon the curative powers of the poisons which excite tetanic symptoms.

POISONED WOUNDS.

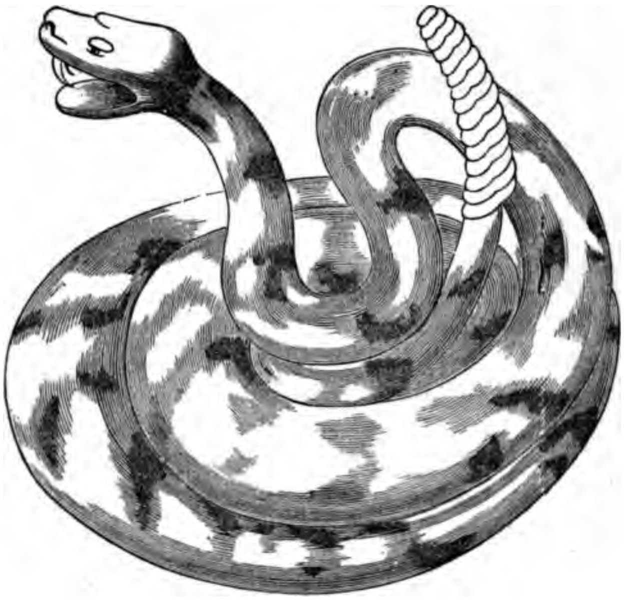
SNAKE BITES.

Many countries are infested with venomous serpents which inflict deadly bites. The phoorsa-snake and the cobra di capello of the East Indies are among the most dangerous of reptiles. Death from snake-bite is exceedingly common in British India, thousands of the natives falling victims every year. The fatality arises in part from the fact that the people have little faith in the practice of educated physicians, and unbounded confidence in the "charm" treatment of the native medicine men.

The most poisonous serpent known is the *Fer de lance* of the West Indies. Its bite almost always proves fatal, death generally occurring in a few hours after the reptile has inflicted a wound. Regions infested with such a venomous creature remain a wilderness; and when the snake appears in the cultivated districts it is hunted down like a wild beast.

The rattlesnake is the commonest venomous reptile in America; but the warning imparted by the rattle at the end of its tail is impulsively heeded, so that few persons are unfortunate enough to be bitten. Besides, the poison of the crotalus is not so deadly as that of the cobra, or hooded snake of India. One of the keepers of the Zoological Gardens, London, a few years ago was bitten in the bridge of the nose by a cobra, and though the victim immediately swallowed a glass of rum, and took some of Bibron's antidote, he died in a little more than an hour from the reception of the bite.

FIG. 22.



(Crotalus horridus) Rattle-snake.

Besides the rattle-snake there are several venomous serpents in America. Among the most noted are the moccasin or cotton mouth, and the copperhead. These snakes are short, thick, and quite sluggish in their habits, rarely biting or making an attack unless disturbed or provoked.

The poison fangs are hinged by their base to the upper jaw, and are raised or made erect by muscular action when a bite is to be inflicted; and the fangs are hollow to an opening near their points, resembling in mechanism the nozzle or needle of a hypodermic syringe. The toxic fluid is secreted and retained in a sac at the base of the fang; and when a bite is inflicted, the poisonous fluid is forced through the canal of the tooth into the flesh of the victim.

As a general thing, the larger the serpent the more deadly the poison. The prairie rattle-snake, so called from its living in the grass of the open or cleared lands, is moderate in size, and rarely inflicts a deadly bite, but the massasauger of the wooded districts attains a large size, and its bite is about as fatal as that of the cobra. In the swamps and river bottoms of the Southern States, the rattle-snake attains a length of six or seven feet, and a circumference of the calf of a man's leg. The thickest part of such snakes is towards the tail, and is triangular in shape, the under side being flattened to form a pedestal for the support of the anterior portion of the reptile when the head is raised to strike. If a venomous snake can be provoked to bite a chicken, rabbit, or other animal, several times in quick succession, the poison sacs become emptied, so that it is comparatively safe to receive a fang-wound. The snake-charmers of India extract the fangs of the serpents employed in performing tricks, so that the reptiles thus treated are harmless.

The reflex action of the nervous system of a rattle-snake is such that it is not safe to meddle with a decapitated creature. Mr. Dury, of this city, was collecting specimens in Florida for our Society of Natural History, and meeting with a large rattle-snake he shot its head from the rest of the body. After experimenting with the headless trunk, and finding it would strike when irritated, as if the head were still present, he undertook to stuff the mouth and throat of the beheaded reptile with cotton; and while engaged in this operation the few inches of head and neck plunged forward, and one fang made a slight scratch in his thumb. And although he excised the wound at once and sucked it, in a few minutes Mr. Dury became dizzy, blind, and nauseated. His friends gave him whisky, and took him to a physician experienced in the treatment of snake-bites. The thumb, arm and shoulder were very much swollen and painful, and the skin of the region acquired a yellow tinge and a mottled appearance. The physical prostration was very great, yet the recovery was complete except the loss of the thumb by sloughing.

Shortly after the bite of a venomous serpent there is a sharp and burning pain in the wound, which extends up the arm or leg from the point bitten. Swelling rapidly succeeds, which seems to come from effusions of serum, and extravasations of thinned or disorganized blood. The color of the limb changes, as if affected with cellulitis or erysipelas; and the mottled appearance has been fancied to resemble the hues of the snake. As the disease advances the prostration and difficulty of breathing portend a fatal issue, especially if cold sweats, vomiting and relaxation of the sphincters occur.

TREATMENT.—Every country has its popular antidotes for the poisonous bites of serpents, yet little reliance can be placed upon the alleged antidotal powers of "rattle-snake weed," or upon remedies used by the natives. There is a common belief that the Indian, when bitten, will soon find an herb which counteracts the force of the poison and saves life; but no reliance can be placed upon such authority. Even the vaunted antidotes of scientific men are found to be unreliable. Dr. L. Weir Mitchell, of Philadelphia, made a series of experiments to ascertain the value of the so-called specifics, and he found that few of them exerted any antidotal influence. Even the highly extolled "Bibron's antidote" proved powerless. Iodine has been praised as having power to neutralize the venom of serpents, yet it does little if any good, whether applied locally or taken internally. For awhile it was asserted that the poison of serpents was acid, consequently alkaline agents should be employed to neutralize the toxic property. That idea, too, has been exploded by experiment. Inasmuch as a patient fatally bitten exhibits coma before death, the theory was advanced that stimulants were needed to arouse the vital energies and prolong life until the virus could be eliminated, therefore whisky was put forward as the best specific. Even profound intoxication was advised by parties in good standing who claimed to have observed the most flattering results from the free use of alcoholic stimulants. Probably the moderate use of whisky to help overcome the great nervous shock, is commendable, but anything like absolute intoxication is to be avoided. Alcohol is not an antidote to the poison of serpents, but it helps to overcome the nervous depression, and to support the vital powers until a safe point is reached—in no other respect is the agent a "specific" for snake-bite.

If a person survive the immediate effects of serpent-venom, he may die from septicæmia which sometimes follows suppurative cellulitis, or succumb to a typhoid state which may be one of the sequelæ of the disease.

As soon as a snake-bite is received, the part containing the injected poison is not deep, and should be excised at once; the wound thus made should be subjected to the direct influence of salicylic acid. A wine-glass of whisky should be swallowed at once or as soon as practicable, and more should be administered every hour or two, but profound intoxication is to be avoided. The muriated tincture of iron in five drop doses may be prescribed with the hope of exerting a beneficial influence upon the blood. The parts most affected with swelling should have a soft wrapping, and a lotion of dilute carbolic acid. When abscesses form in the axilla or groin, they should be hastened to maturity by the use of poultices, and then evacuated in the usual way. Horrid distortions sometimes are a sequence of extensive sloughs.

It seldom does good to ligature a limb above a venomous bite, as the toxic agent will at length get into the general circulation, though its course may be retarded a few minutes. If a finger be bitten the digit better be amputated instantaneously; and if the operation be not done at once, it will avail nothing.

STINGS OF INSECTS.

The sting of the hornet, wasp, bee, and yellow-jackets, is exceedingly painful at the time of reception; and the swelling which follows is often considerable, but the consequence is not serious unless the venom be introduced near the eye. It is rare that a medical man is called to treat a person suffering from the effects of stings, unless the party in distress has been the victim of the combined attack of a swarm of bees or a "nest" of hornets. Sometimes a wasp leaves its stinger in the flesh, and then the consequence is somewhat severe unless the foreign body be removed with delicate nippers. The parts adjacent to the wound swell, and at length suppurate.

An eyelid greatly swollen from the effects of a bee-sting is to be wetted often with Pond's extract of hamamelis, a dilute tincture of aconite, spirits of camphor, or kindred agent. Ammonia has been highly recommended on the ground that it enters the wound and neutralizes the acid character of the poison, but it is a mistake to suppose that the agent accomplishes any real good. None of the animal poisons are thus antidoted. The pain passes off in a few minutes, and the subsequent inflammation is to be combatted upon the same principles as a similar grade of disease, arising from other causes, should be managed. A stimulant or anodyne might be of use in severe cases, and locally a fomentation, yet as has been intimated before, the services of a physician are seldom needed or demanded.

SPIDER BITES.

Women and children entertain a great horror for the bites of spiders; but it is doubtful whether any of the arachnidæ in temperate climates ever do the slightest harm to man. I have caught the largest and most vicious in my hands, and never could provoke one to bite me.

The scorpion of tropical countries has the reputation of inflicting an exceedingly dangerous bite or sting. The caudal extremity of the creature is armed with a hooked claw which inflicts a wound, but whether of a venomous character or not, is not well established. If credence could be placed upon the extravagant stories related of the scorpion and tarantula, an abode in a country infested with such poisonous creatures would be anything but attractive. As a general thing the venom of spiders, scorpions, tarantulas, and centipedes, is popularly regarded as more deadly than it really is. Although the tarantula and centipede of our Southern states arè reputed as dangerous creatures to come in contact with, they rarely do any harm unless provoked. They are exceedingly erascible when teased, and while boiling with rage a poison may be developed in their bodies. The tarantula and centipede may crawl over the hand and face without leaving a mark or inflicting pain; but if pinched or worried, they inflict scratches and bites which in a person having a bad state of health, might turn out disastrously. The prick of a pin or thorn may act as the exciting cause of the outburst of a disease that was awaiting an opportunity to display its virulency. An insect comparatively innocuous has been known to call into action a dangerous morbid state. The seriousness of the wound did not come so much from the venomous character of the insect, as from the disordered state of the victim's blood.

A leg having a varicose state of the veins and an eczematous condition of the skin, might be thrown into a violent state of irritation by the sting of a mosquito or the bite of a bed-bug; a slight abrasion inflicted with the finger nail might prove as poisonous and serious.

HYDROPHOBIA.

Rabies is a disease which originates in the dog, and may be communicated to man by means of the teeth or saliva of an affected animal. Hydrophobia signifies the same as rabies; and has been employed to denote canine madness on account of a prominent and distinguishing feature of the disease, viz., "dread of water."

It is said that the wolf and the jackal, and the horse, are susceptible to rabies, yet no well authenticated cases of the disease in those animals have been recorded. There are also declarations that the cat may become hydrophobic after having been bitten by a mad dog. Although instances of hydrophobia are extremely rare in man, there is no question but such a disease is communicable to some individuals. I doubt whether the virus of rabies will affect all persons.

The distinctive features of hydrophobia are somewhat like those of tetanus, epilepsy, hysteria, and the poisoning of nux vomica, yet are sufficiently marked to be recognized. A hydrophobic attack in man is characterized by great anxiety, dread of water, dryness of the mouth and fauces, perversion of the judgment, appetites, and passions, and by horrible convulsions.

An individual bitten by a mad dog does not show signs of the disease for six or eight weeks; and then the earlier symptoms are not pronounced. There may be itching and irritation at the cicatrix of the bite, and a general languor, attended with chills and hot flashes. After a day or two of such symptoms, all of which may be attributed to a cold, greater systemic derangements manifest themselves, such as fever, nausea, headache, tremor, sleeplessness, and delirium. The cicatrix becomes inflamed, and ulcerates, the broken place discharging a thin, watery, purulent fluid. The muscles of the throat and chest seem to be restricted in their action, so that a sense of suffocation is manifested. Although the disease is one in which the swallowing of water would seem to be exceedingly pleasant, the sight of the cooling draught provokes such spasmodic action in the muscles of the throat that not a drop can be swallowed. In the history of disease there is none more distressing or more fatal than hydrophobia. It would seem as if the "Furies" in their rage had developed a virus which embodied the horror of horrors. The tortures of the damned, as depicted by Dante and Milton, do not equal those of the hydrophobic, except in duration.

Dr. Marcet, in the *Med.-Chir. Transactions*, in describing a patient that came under his observation, says: "On our proposing to him to drink, he started up and recovered his breath by a deep convulsive inspiration; yet he expressed much regret [illegible] perceived it would give him great [illegible] sweaty and clammy. On being [illegible] up a cup of water in one hand [illegible] The thought of drinking out of [illegible] : but he seemed determined to [illegible] an expression of terror, yet with [illegible] spoon, and proceeded to carry it to [illegible] reached his mouth, his courage forsook [illegible] resist. He repeatedly renewed the [illegible] success. His arm became rigid and [illegible] to raise it to his mouth, and he [illegible] against the spasmodic resistance. At last, [illegible] with a kind of convulsive effort, he sud- [illegible] mouth a few drops of the fluid, which he [illegible] But at the same instant he jumped up from [illegible] the end of the room, panting for breath; [illegible] indescribable terror fell into a convulsion. A [illegible] proved fatal."

[illegible] stated that the voice of a hydrophobic man resem- [illegible] a dog; and that his actions in general are [illegible] While it is not unreasonable that efforts to [illegible] would be attended with hawking sounds [illegible] imagined to resemble barking, it is not probable [illegible] peculiarities of the dog are transmitted with the [illegible]

[illegible] an excellent opportunity to observe the actions of [illegible] with rabies. The animal, one morning, was [illegible] morose and retiring, and would growl and snap [illegible] During the forenoon he came to his master two [illegible] and attempted to bite his boots; his hair was [illegible] back, and his eyes were green, as if in anger. These [illegible] led to the suspicion that the animal might be [illegible] he was put into a room where he could be watched [illegible] window. Food and water were placed within his [illegible] he did not partake of these. He was inclined to sleep [illegible] time, yet his rest seemed disturbed. He yawned, [illegible] and moaned as if uneasy, unsatisfied, and at times dis- [illegible] On the second day he could not walk without staggering, [illegible] no attention to a whistle or the call of his name. A [illegible] was used to rouse him and to try his temper. This he [illegible] at and bit, but he did not recognize the person handling the source of annoyance. I think it would have been safe to enter his place of imprisonment, though an attempt to enter was not made. The rabid animal spent much of his time near some rotten flooring which he gnawed vigorously. On the fourth day from the first manifestations of the disease the dog died, and seemingly in a convulsion, the last of a series, though the paroxysms were not well marked. I examined the dead animal quite thoroughly, using some precautions while inspecting the mouth and fauces. The lips and tongue were purple and congested, but not swollen. There was a little froth in the throat, and in the larger air passages. The abdomen appeared greatly distended, and the limbs and neck emaciated. The stomach was crammed with coarse pieces or gnawings of rotten wood, with straw and dirt intermixed. None of this indigestible material had passed the pylorus, and the intestines were quite empty of feculent matter. The bladder was distended with intensely strong smelling urine. I doubt whether the bladder had been emptied since the earliest manifestations of the disease.

In Youatt's description of rabies canina, he says: "The disease manifests itself under two forms: The *furious* form, characterized by augmented activity of the sensorial and locomotive systems, a disposition to bite, and a continued peculiar bark. The animal becomes altered in habits and disposition, has an inclination to lick or carry inedible substances, is restless and snaps in the air, but is still obedient and attached. Soon there is loss of appetite and thirst, the mouth and tongue swollen; the eyes dull, red, and half closed; the skin of the forehead wrinkled; the coat rough and staring; the gait unsteady and staggering; there is a periodic disposition to bite; the animal in approaching is often quiet and friendly, and then snaps; latterly, there is paralysis of the extremities; the breathing and deglutition become affected by spasms; the external surface irritable, and the sensorial functions increased in activity and perverted; convulsions may occur. These symptoms are paroxysmal, they remit and intermit, and are often excited by sight, hearing, or touch.

"The *sullen* form is characterized by shyness and depression, in which there is no disposition to bite and no fear of fluids. The dog appears to be unusually quiet, is melancholy and has depression of spirits; although he has no fear of water, he does not drink; he makes no attempt to bite, and seems haggard and suspicious, avoiding society and refusing food. The breathing is labored, and the bark is harsh, rough, and altered in tone; the mouth is open from the dropping of the jaw; the tongue protrudes, and the saliva is constantly flowing. The breathing becomes more difficult and laborious; there are tremors, vomiting and convulsions."

It is to be borne in mind that teething puppies are liable to convulsions, and while in a paroxysm they may froth at the mouth, snap, and exhibit other signs of madness, therefore it would be unreasonable to pronounce every suspiciously behaved dog as hydrophobic. If a nervous individual should be bitten by such a strangely acting animal, the thought of having hydrophobia might bring on false appearances of the disease, and lead to groundlsss anxiety and useless treatment. An erratic dog that has bitten others of the canine family should be killed or securely caged, to prevent additional accidents, and the worst consequences; but it is foolish, mischievous, and culpable, to say that a person is to have hydrophobia because a scratch or tooth-wound has been received from a worried, frightened, or maniacal dog. I was once professionally called to a hysterical individual who had been bitten through the thumb by a mastiff. The wound was inflicted several months previously, and the dog had shown no signs of madness, therefore there was no probability that the man had hydrophobia, yet he stared wildly, called for water, yet refused to drink, gnashed his teeth, and manifested convulsive action. He believed he had hydrophobia, and imitated the disease quite well, yet he recovered, which was the most convincing of arguments that he never had the disease, for a real case of hydrophobia has never been cured or recovered from.

Writers upon hydrophobia lay down courses of treatment as if something substantially beneficial might be expected from the therapeutic course; and it is natural to suppose that antispasmodics would do some good; or that some remedial means might be devised which could be relied upon as curative; but no such agencies have been scientifically suggested or empirically stumbled upon. I confess that I have no hope or expectation that an antidote to hydrophobia will ever be discovered. Animal poisons are virulent, and incapable of being neutralized. When not potent and in small quantities, the conservative powers of the body may eliminate the virus without much harm being inflicted; but the medicinal agent has yet to be discovered which neutralizes the noxious qualities of zymosis. Remedies and nutrients may be given which shall sustain the vital powers until the venom has been diluted and eliminated, yet such agencies can not be regarded as antidotal to the poison. The only reasonable method of preventing hydrophobia after a mad dog has inflicted a bite, is to excise the wound before the virus has had time to enter the vascular system. Tightly constricting a limb until amputation could be performed, might save systemic invasion. However, those who sustain bites from rabid animals, have not the courage and the ability to efficiently excise the wound; they are more likely to speculate hopefully upon the vaunted powers of a "mad-stone." It is surprising to think how many persons of ordinary sense in regard to common matters, are credulous enough to believe in the absurd delusion that a stone can possess the power to extract poison from a wound. A piece of rock might be made into the form of a cupping glass, and used for that purpose, but there is no other mystery connected with the affair.

It is generally supposed that hydrophobia is commonest during the summer months, or while the dog-star reigns, yet statistics prepared to show what season is most favorable to the development of the disease, seem to prove that July and August have fewer cases than the colder months of the year. The most cases occur in February, although that is the shortest month.

While I have thrown discredit upon efforts to cure patients afflicted with hydrophobia, I would not discourage attempts to alleviate the most distressing symptoms. The hypodermic use of morphia, chloral, or chloroform, may allay the distress, and restrain the paroxysmal tendencies of the disease. During the seasons of comparative ease the patient is to be fed with ice-cream, or such food as can be swallowed. The back of the head and neck should be wetted frequently with tincture of aconite, as in the management of cerebro-spinal meningitis. If the patient can be kept alive long enough for the force of the disease to spend itself, recovery is possible.

GLANDERS.

The horse is subject to a disease which is characterized by a purulent discharge from the nostrils, and by a swelling of the lymphatic glands; the morbid condition takes the name of farcy, or glanders; and if man becomes inoculated with the virus he is liable to have an affection which does not differ essentially from that which originates in the equine family. Those who feed, curry, and tend horses are particularly exposed to the contagion; and as hostlers generally understand that they are in more or less danger, they handle suspected animals with much caution. Horses frequently have catarrhs and distempers which are characterized by purulent discharges from the nose, yet if the skin be not studded with lumps or knots—farcy-buds—the probability is that something milder than glanders is present.

A horse suffering from farcy rarely recovers, though he may survive for months, therefore it is best to kill a suspected animal at once. The reason for such a course is that some person may become fatally inoculated, and that the owner of the creature loses least by the early death of the animal. A horse which has survived an attack of glanders is not worth what it cost to keep him through a long period of sickness.

Youatt, in his work "*On the Horse*," speaks of *glanders* as a disease confined to the nose, jaws, and head; and of *farcy* as an affection of the lymphatics; but I have not seen a case of glanders that continued long without the farcy complication. And if man takes the disease, he will not escape without a copious discharge from the nose, and the knotted lymphatics which are prone to suppurate when highly inflamed. The knots form along the course of the lymphatic chains, and the inguinal and axillary glands are disposed to suppurate and to degenerate into foul ulcers. The earlier symptoms of the disease do not vary much from those which are manifested in small-pox. There will be chills and hot flashes, terrible pains in the head and back, fever, restlessness, anxiety, and great vital depression. At length, after several days of general *malaise*, an eruption of nodules appears, or, rather, can be felt in the skin, as if small-pox was breaking out; but the lumps are larger and not so near together as in variola, and they show themselves along the course of the veins of the arms and legs, and not upon the face and front of the chest. During the eruptive stage the limbs are extremely sensitive and painful, the muscles and bones seeming to be sore. The glands in the neck, arm-pits, and groins, are the most highly inflamed, and the most liable to suppurate. The nasal complication produces blinding headache; and the discharge from the nostrils is watery at first, then purulent, and finally viscid and tenacious like glue. Lastly, night sweats, diarrhœa, and great emaciation bring about a fatal issue.

During the course of the disease the treatment should be directed to the mitigation of the worst symptoms. Morphia administered by the mouth or hypodermically is the most valuable of remedies to use in this disease. Suppurating nodules may be poulticed, and ulcers may be washed with carbolated fluids. The frontal headache may be temporarily alleviated by the inhalation of chloroform. As soon as boils or abscesses form, they should be evacuated, and their cavities washed with a solution of salicylic acid.

Turpentine has been highly recommended in the treatment of glanders, and from what I know of its action in kindred diseases, I think it might prove one of the most valuable of medicinal agents to be employed both internally and externally. Turpentine exerts a beneficial influence in the management of zymotic diseases.

DISSECTING WOUNDS.

Students of medicine enter the dissecting room with lively apprehensions of danger attending the dissection of the human body; they seem to be haunted with the idea that the human cadaver develops an animal poison which is more virulent than any which is evolved by the decomposition of the bodies of the inferior creatures; and they engage in dissection with gloves on, or with the hands smeared in sweet oil, or other oleaginous covering.

It is well known that putrefactive changes take place in animal bodies soon after death; and that, in some instances, a venomous ferment or zymotic poison is evolved, which may be transferred to a person in good health through the medium of a tenaculum-wound, scalpel-incision, scratch, hang-nail, or abrasion. The poison is most virulent a few days after death, and in bodies full of decomposing blood and other highly putrefactive fluids. When a cadaver has reached an advanced stage of decomposition, the virulence is very much lessened. The body of a person dying of erysipelas, typhoid fever, or peritonitis, has virus in it as soon as death occurs; and the poison is of the most virulent type.

There is the same danger of becoming inoculated with an animal poison while holding an ordinary autopsy, as in making anatomical observations in the dissecting room; but if physicians and students engaged in such studies would exercise ordinary care and attention, especially if enjoying a good state of health, there is little danger of receiving any harm. An individual with a foul stomach and deranged bowels should not expose the hands to the contact of decomposing animal fluids, though poisoning from dissecting wounds is not common. Generally there is too much reluctance on the part of medical students to the handling of anatomical material. Occasionally, however, a promising medical man loses his life by a seemingly insignificant dissecting wound. But there is as much danger in cutting into the body of a pig, cow, or horse, that is found dead in the field, as in dissecting the human body. The student of comparative anatomy incurs as much peril in his investigations as the demonstrator of anatomy in a medical college.

A person receiving a small dissecting wound should immediately squeeze it to make it bleed and discharge the virus; he may then wrap the part with a piece of adhesive plaster, to keep other poison from entering. It is not necessary to cauterize the wound, or to abandon dissecting for the time. A sensitive and susceptible individual might judiciously employ a small quantity of carbolic acid in an incised wound received in the dissecting room.

A medical man who has received within his circulation a quantity of animal virus from a body undergoing dissection or autopsical examination, may not know at the time what has happened, but in the course of a day or two he experiences a heavy chill, and a febrile state succeeds, with thirst, languor, and pain in the arm and chest on the side primarily impressed. The veins on the affected side become sensitive, painful and knotted. The axillary glands swell and become tender to the touch. A restless night is passed, with anxiety and mental vagaries. The skin is hot, the pulse accelerated, and the breathing hurried. The appetite is gone, and the bowels are loose or flatulent. In general features the attack resembles an onset of typhoid fever; but the local manifestations are so much extra. A vesicle appears at the point where the virus entered, which passes into a pustular state; and serous blebs may form along the inside of the arm, the chain reaching to the axilla. The *Dublin Hospital Reports* give the account of the case of Prof. Dease in the following language: "His demonstration took place on a recent subject, and he awoke early the ensuing morning with severe rigors, sickness, and acute pain in the left shoulder. On the next day, a fullness was observed above the clavicle, along the left side of the neck, which could not bear the slightest pressure. On the day succeeding, a colorless swelling was noticed about the axilla, which first suggested the real nature of the complaint; and on examining the hand, there was found by Dr. Colles the mark of a slight scratch with a superincumbent vesicle. He appeared to improve a little for a day or two, though full, florid, and crimson erythema occupied the side in the region of the pectoral muscle, extending downwards. On the morning of the sixth day he showed symptoms of delirium; and a vesicle appeared on his forearm, which remained stationary to the last. By the next day the erythematous swelling had extended over the entire side of the body, from a little below the axilla to the hip; and the swollen part became studded pretty thickly with indurated papulæ; the delirium was more confirmed. On the eighth day the inflammation completely involved the axilla, and on its posterior edge an abscess seemed to have formed, though there was no fluctuation. At this period the opposite or right arm exhibited an intumescence on its anterior part, occupying about a hand's-breadth of the flexor muscles, which was punctured on the same evening and discharged about a teaspoonful of serous fluid, but without relief; and within an hour or two afterwards, being the eighth day of the accession of the disease, he expired."

The treatment of a person laboring under the influence of poison received through inoculation from a dead body, should consist in the administration of quinia and mineral acid for a day or two. An opiate might be needed at night if the patient was in pain and restless. Turpentine should be rubbed upon the chest and abdomen twice every twenty-four hours. The arm and side should be moistened every three hours with glycerine and carbolic acid in combination. Any vesicles should be punctured and their cavities cauterized with carbolic acid.

After the second day the patient should have no medicine, unless there were a special indication for it, but he should be fed on ice-cream, and stimulated with refreshing draughts of champagne. Beef-tea might be given once a day, and directly afterwards ten grains of pepsine should be swallowed. If the breath be foul, and unpleasant eructations come from the stomach, three grains of pulverized sub nitrate of bismuth, mixed with one grain of salicylic acid, could be given to advantage every three or four hours.

BURNS.

A lesion produced by the action of intense heat is called a burn, whether it has resulted from the effect of fire directly applied, or from a hot substance. Heated solids sear the skin and char the flesh, molten metals do the same, and scalding fluids and vapors produce superficial yet extensive lesions. Even the rays of the sun will blister a delicate skin, and excite considerable inflammation. The effects of a caustic or escharotic are similar to those produced by the action of caloric; and the cicatrization which follows is not unlike that following ordinary burns.

It is surprising what a degree of heat a blacksmith's hands will stand without being unpleasantly impressed. It is common for them to pick up a piece of iron nearly red hot, and to handle tongs that would quickly sear the delicate palms of those unused to such things. A woman who is daily manipulating stove and range furniture, has acquired the power of enduring degrees of heat that would scorch the hands of a lady not accustomed to manual labor. The immunity comes in part from an indurated cuticle, and in part from the skill acquired in handling heated substances.

Burns come in a thousand ways. Those who work in foundries, and in laboratories where molten metals are poured, are liable to burns of a deep and serious character. The explosions of boilers produce scalds from the disorganizing effects of superheated water and steam. Although water boils at 212° at the sea level, it is not raised to a higher degree of temperature in an open vessel on account of the cooling effect of unrestrained evaporation; but the heat of water in a locomotive boiler which is carrying 120 pounds of pressure to the square inch, is immeasurably hotter than ordinary boiling water, consequently when a boiler explodes the scalding effect of the escaping water and steam is akin to that of molten metals.

Females are frequently sufferers from burns through the combustible materials of their clothing. Their skirts frequently come in contact with the flames of a grate; and in the event of a conflagration their chances of escape without their clothing taking fire are not equal to those of men who wear less combustible materials.

Children not unfrequently fall into the fire and receive severe burns before they can be rescued and their burning clothing stripped from them; and they are apt to scald the front portions of their bodies by upsetting vessels of boiling water. A bad feature connected with lesions of this character is the cicatricial contraction which may distort the face by drawing down the eyelids, under lip, and chin; or permanently contracting the arms and fingers, the displacement amounting to dislocation of joints and anchylosis; and, finally, the genital organs of either sex may be so disorganized and distorted that their development and functions will be lamentably restricted.

A common cause of burns on the hands has arisen from the use of "rose oil"—gasoline—in glove cleaning. After the gloves are scrubbed with the inflammable fluid, they are drawn upon the hands and then dried by a lamp or jet of gas, to prevent undue shrinkage; while the drying process is going on, the inflammable vapor becomes ignited, and before the gloves can be removed the hands are distressingly burned.

The disorganizing power of heated oil, lard, or tallow, is much greater than that of hot water. Scalding steam may be inhaled, blistering the mucous lining of the air passages, and creating respiratory difficulties that prove rapidly fatal. The most distressing burns come from hot vapors, the skin being extensively vesicated, and the mucous membranes of the nose, larynx, and bronchial tubes highly irritated.

Wood, coal, and solid bodies in a state of incandescence rarely inflict a burn over wide spread areas, yet they carbonize the tissues to considerable depth. A young man of my acquaintance fell, in an epileptic attack, and his arm rested for two or three minutes upon the edge of a red-hot wagon tire. The lesion was restricted to a small area, yet the carbonized tissue sloughed clear to the bone.

Baron Dupuytren, in his *Essay on Burns*, says: "Such lesions may be conveniently divided into six degrees of burning: First, erythema or superficial phlogosis of the skin without the formation of phlyctæna. Second, cutaneous inflammation, with the loss of the epidermis, and the development of vesicles filled with serum. Third, the destruction of a portion of the papillary body. Fourth, the disorganization of the whole dermis, to the subcutaneous cellular tissue. Fifth, the formation of eschars of all the superficial parts, and of the muscles, to a greater or less distance from the bone. Sixth, the carbonization of the whole thickness of the burned part.

"The first degree is generally produced by the action of radiating caloric, or by burning vapors, or finally by the application of bodies more or less hot. The parts then present a vivid redness, which is not circumscribed, analogous to that of erysipelas, which is momentarily removed by the pressure of the finger; the patient feels a sensation of scorching heat, which continues during the whole of the disease. Frequently in a few hours, but always after a few days, the redness, heat, and pain disappear, and the inflammation terminates by the desquamation of the part.

"However slight the burn may be, in this degree, when it attacks broad surfaces, the pulse sometimes rises and becomes frequent, the tongue reddens, and the phenomena of gastro-intestinal irritation develop themselves. When it is situated in the head, the irritation may extend to the encephalon, and cause wakefulness, delirium, convulsions, coma, and even death. The second degree always supposes a more energetic cause, and the scorched part is vesicated. The third degree calls for not only phlyctæna of the cuticle, but circumscribed sloughs of the true skin. The healing of such a lesion is followed by a cicatrix. The pain is great, the shock depressing, and the danger great if a considerable portion of the body be implicated. The peril is great if one-third of the surface of the body be burnt to the third degree.

"In the fourth degree not only the skin, but the subcutaneous tissue is burned, so that the healing process is prolonged, and the cicatricial tissue distorts by contraction. The danger is imminent if one-fourth of the surface of the body be thus implicated.

"The fifth degree may be expressed as an aggravation of the fourth, or as an increase in the intensity of the heat. The peril is great from shock, from brain and intestinal disturbances, and from exhaustive suppuration. Few survive this degree of burning, especially if the parts involved reach several square inches of area.

"The characters of the sixth degree are distinguished more easily. The limb is then charred on its surface, hard, insensible, and easily broken in attempts to bend it; and the eschar, when detached, leaves behind a stump which is more or less irregular, according as the fire has affected the different organic elements at different heights." This is illustrated by a young man, who in walking through a foundry, placed his foot in the trench through which the fused iron was about to pass; the melted metal rolled over it, and when the limb was withdrawn, the foot and lower part of the leg were destroyed. He scarcely felt the pain, and did not at first perceive the horrid mutilation.

Persons who fall into tanks of scalding fluids may die instantly, though in some instances they may survive for several hours. Autopsies of bodies thus affected, reveal congestions of the brain, and the greater or more vitally important viscera. In the event that a person burnt as thus indicated, survives a few hours, the death is not from inflammation, but from excess of pain. Shock and suffocation produce the instant deaths.

Patients who undergo the third and fourth degrees of burning suffer from shock, then are in danger from severe pain, visceral disturbances, erysipelas, exhaustive suppuration, and septicæmia. A burn is a grave injury, therefore the prognosis, in lesions of a deep or extended character, is to be guarded. All are familiar with the slight burn, and may know of a popular remedy for its cure; yet few medical men ever become conversant with the worst features of lesions produced by excess of heat, therefore it may be wise to consider in advance what is to be done first when called to a case of extensive burning. As has been intimated, the shock is great, and a stimulant is needed to overcome it; the patient is to be taken to a warm room, and whisky administered; the pain is to be subdued by chloroform, chloral, morphia, or the most powerful anodyne at command; the clothing is to be cut from the burnt surfaces, and the vesicated parts are to be covered with sweet oil, lard, or any simple cerate. If the disorganized skin has been covered with flour, raw cotton, or any such unscientific application, the thickest of the objectionable material is to be removed before the oleaginous preparation is used.

After the anodyne effect of the medicine has passed off, and a febrile condition, with less pain, has succeeded, the patient is to have drop doses of veratrum tincture every three hours. In fact, an anodyne at night, and a febrifuge during the day, should constitute the constitutional treatment for a week or two, or during the inflammatory stages of the morbid action. During the suppurative periods, iron, mineral acids, quinia, and the choicest nutrients should be employed.

On the second or third day the burnt surface is to be dressed with Mayer's ointment. A thousand salves are in reputable use for the cure of burns, and some of them are not altogether objectionable or useless, but none approaches in desirable qualities the ointment of Mayer, as formulated in King's Dispensatory. The unguent is to be spread on thin strips of cloth and applied directly to the burnt surfaces. Slight smarting attends the application, but this soon passes off. The medicinal qualities of the ointment seem to check excessive suppuration, and to keep the granulations firm; a severe burn should be dressed twice a day.

The deformities likely to follow from cicatrization are to be anticipated and prevented, or favorably modified, if possible. A burn on the side of the neck may draw down the corner of the mouth, and the under eyelid, besides tilting the head to one side; a cicatrix following a burn on the front aspect of the arm, may impair the movements of the elbow; and the fingers may be joined together and hopelessly distorted. Among the most distressing of deformities, except a horrible twisting of the features, may be an adhering of the male genitals to adjacent parts, or the closure of the female genital fissure. Too great care, therefore, can not be exercised in attempts to obviate such untoward consequences.

Burns vary so much in location and character that no definite rules can be laid down for the prevention of deformity. A suspicious drawing of one side of the neck may be opposed by forces tending in the opposite direction. So at the elbow and the wrist. The fingers must be kept wrapped in distinct stalls, and prevented from becoming rigidly flexed by the use of a ball fastened in the hollow of the hand. The penis can generally be kept from uniting to the scrotum, and the scrotum from the thighs. The vulval fissure of the female must be kept from obliteration by the efficient use of oiled pledgets of lint. Many deformities following burns may be erased or favorably modified by the removal of the inodular tissue, and the substitution of elastic skin by transplantation.

When the ulcer following a burn is so large that it refuses to heal, though covered with exuberant granulations, a reproduction of the integument may be brought about by the fixing of a few tegumentary grafts, of the size of a pin's head, which are to be clipped from healthy skin.

During the healing of a burn the granulations may push forward so fast that they may be regarded as fungous, consequently it may be judicious to touch them with an astringent or caustic.

The sulphate of copper crayon may be swept over them; or a little tannic acid can be sprinkled on them.

While suppuration is going on freely, and the fluids are liable to become foul, it is well to use carbolic or salicylic acid on the purulent surfaces. The "antiseptic method," recommended by Lister, is not usually practicable in the management of burns. The air can not be excluded from a large suppurating surface, and the production of pus in considerable quantities can not be prevented by any kind of dressing or treatment.

It may be stated in this connection, inasmuch as a question in medical jurisprudence may arise in which such knowledge may be needed, that the application of heat to a dead body will not produce vesication. The dead skin may be charred, but no blebs, phlyctæna, or serous blisters can be raised on it, consequently a scorched or carbonized structure which exhibits no vesication, must have been produced after death.

SKIN GRAFTING.

Something analogous to modern skin grafting has always been recognized. A severed finger, quickly restored, has been known to unite and become serviceable. John Hunter transplanted the spur of a chicken to its comb, and found that the horny substance not only lived, but grew; the Chinese in San Francisco engrafted the ends of rats' tails to the heads of other rodents, in the place where horns grow in some animals, and sold the fixed-up creatures at a high price as specimens of a new species of horned rats. The trick was not discovered until the young turned out as hornless as the ordinary animal.

In Oct. 1869, M. Reverdin, of Paris, successfully transplanted small portions of integument from the healthy parts of a patient's body to the granulating surface of a large sore; and under which treatment the ulcer healed, the specks of transposed skin extending by growth of their borders, until there was a coalescence of the extended boundaries, and a complete covering in of the ulcerated parts.

The operation was soon repeated by other surgeons in various parts of the world; and now may be considered as legitimate as any ordinary plastic operation. The bits of skin transferred, carry with them vitality, and soon adhere to the raw surface, nutriment being supplied by the parts with which the pieces are in contact. When once fixed in their new position, the epidermic cells begin to reproduce themselves, or proliferate, so that growth takes place along the borders of the grafts.

The range of cases to which skin grafting is applicable, is quite extensive. In the management of large ulcers it is found that the denuded surface is so broad that the healing process sometimes refuses to close the breach, or progresses so tardily that it becomes desirable to introduce a new healing element. Large granulating surfaces following extensive burns can be brought speedily to a healing condition by the employment of tegumentary grafts. The division of cicatricial tissue to overcome deformities is often followed by a slowly healing ulcer, and a contraction of the inodular tissue, but the introduction of a few skin grafts secures the closure of the wound with elastic integument. After a large plastic operation has been performed, it may be convenient to close the gap by the assistance of skin grafts. When an artificial nose is taken from the forehead, the chasm can not be filled by a drawing together of the adjacent integument, therefore skin grafting to close the wound, becomes invaluable.

The process of transplanting consists in excising a minute piece of skin from the anterior aspect of the forearm, and transferring it to a clean spot on the ulcer or granulating surface, a little pressure being employed to indent the graft. A delicate pair of forceps may be used to raise a piece of skin a little larger than a pin head; and then a slender pair of curved scissors executes the excision. The entire thickness of the skin is not required, but the upper layers. Too deep a clip does not make so good a graft as a shallow cut. When several grafts are needed they may all be excised before applying them to the sore. After they have been placed at the distance of half an inch from the border of the ulcer, and from one another, they may be covered with a piece of oiled gutta-percha skin, a thin layer of cerate, or a piece of isinglass plaster. This should be overlaid with raw cotton or lint, and then a bandage should be made to hold all snugly in place. On the third or fourth day the dressing should be carefully removed, and a fresh layer of isinglass plaster applied, the lint and bandage finishing the re-dressing. When the first dressing is removed some of the grafts are plainly distinguished as white nodules, evidently adherent and alive; sometimes all appear to be dissolved and lost; and occasionally the surface of the graft will be seen detached, though if the lower part—basement layer of the cuticle—be attached, the graft will prove a success.

If a single graft has taken root, it is to be carefully tended until firmly established, then other grafts may be planted to take the place of those lost. At the first re-dressing a small stream of warm water may be squeezed upon the sore to wash away the foul fluids, but the surface of the ulcer should not be wiped, as even a light friction might uproot the tender grafts.

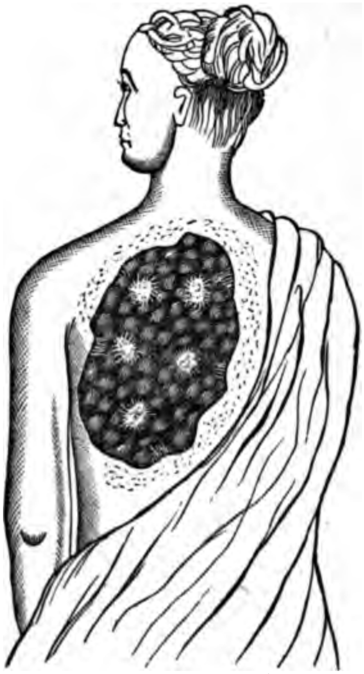
The cutifying centres, or islets of skin, when once established, rapidly extend the cicatrizing process, and exert a healing influence upon the borders of the sore. In a brief period cicatricial bands or bridges will be observed to extend from islet to islet, and to the healing border of the ulcer; and not many weeks will be required for a large granulating surface to become covered with elastic integument. If the ulcer be very large the grafts may be placed an inch apart, yet within a half inch of the border of the sore.

The chief requisite for success is that the surface of the ulcer be healthy. I once tried the grafting process upon a negro's thigh, the ulcer being six inches in width and extending clear round the limb; but failed to make a single graft adhere. I observed that no prominent granulations were visible, but the surface of the sore seemed to be covered with a delicate pellicle. No laudable pus was formed, yet a watery discharge was abundant. To establish a healthier state I cauterized the surface; and in a day or two laudable pus appeared and plenty of lively granulations. To this enlivened surface I applied grafts, and was rewarded for my trouble by their adherence. In a few weeks the entire belt was closed in by elastic cicatricial integument.

Recently a young woman came under my professional care who had a large ulcer on the back and shoulder, following a burn. The accident occurred six months previously, and there was little progress made in the healing process. I advised grafting, which she consented to undergo. I took six grafts from the arm of her sister, and applied them to the sore; five of these adhered, and formed active centres for the development of a tegumentary covering. In two months nearly all the sore had healed, though circumstances compelled the patient to do some work while the treatment was going on. As it was not convenient to use a bandage, I employed only a piece of lint spread with cerate, and a covering of raw cotton. A light gown held the dressing in place. I did not allow her to lie upon her back until the grafts had evidently become firmly attached.

Experiments have been made by excising grafts from a negro and applying them to an ulcer on a white patient; and the transplanted skin proliferates just as well, the new pigment cells retaining their original character.

FIG. 23.



Skin-grafts in an active state of growth.

Recently experiments have been tried to make epidermic scales or "skin-dust," adhere to a granulating surface and become centres of cutification. Dry scales are scraped from the arm and pressed upon the sore, then the granulating surface is dressed as after skin grafting. I tried this in one instance and failed. However, my subject was not a favorable one for the experiment. M. Marc See, of Paris, with whom the experiment originated, called the process "epidermic grafting." The very outside layers of the cuticle are dead and worthless; in selecting cells the outer scales should be rejected, and only those used which come from the live skin. Dr. Hodgen, of St. Louis, has made "cell grafting" succeed in several instances. In one case the operator took dead and detached flakes or sheets of epidermic material, from half an inch to an inch in diameter, and placed them upon an ulcer; and adhesion took place! According to Mr. Fiddes, of England, it is only necessary to dust upon a granulating surface the ordinary dry epidermic scales, scraped from any part of the body.

The new skin derived from the growth of grafts is devoid of hair-follicles, sweat glands, and other cuticular characteristics, yet it is superior to ordinary cicatricial tissue.

In the treatment of a case of "scalping," an accident which happened to a young woman while at work near a revolving shaft, her hair becoming entwined with the moving cylinder, I employed skin grafts repeatedly. Some of the transplanted bits of skin and scalp adhered, yet many of them perished. Although the case seemed a favorable one for skin grafting, the best of success did not attend the operations. The repeated use of skin-dust resulted in failures.

FROSTBITE.

The sudden lowering of temperature, until an intense degree of cold is reached, is attended with an arrest of circulation in a part of the body exposed, and an actual freezing of the blood and tissues. The nose, an ear, or finger, which is frosted, becomes pearly white, rigid, and senseless; and the thawing of the same is attended with tingling sensations and severe pain. Swelling comes on, and all the phenomena of inflammation. If the frozen part be thawed gradually in snow or cold water, or under the influence of the spray of ether, the distress is not great, and the danger of a destructive stage of inflammation is moderate.

Frozen feet are most liable to be followed by sloughing, gangrene, and death, unless amputation save the worst results. The effects of frost upon the organism are quite similar to those of intense heat. Both agencies produce disorganization and inflammation; and, if severe enough, death, or loss of parts, may result.

Frost lesions in cold climates are quite frequent during the rigors of winter, yet the worst phases are seldom met except where a person or party has been lost in a snow storm, or benumbed and bewildered before shelter be reached.

It is not judicious to amputate parts that have been frozen, until it be pretty certain that gangrene of a spreading kind is present. One side of a finger or toe may slough, yet the chasm be refilled by granulations from the adjacent sound structures.

As has been intimated, a frozen part should be thawed slowly in a cold room, or under chilling influences. It is then to have an oleaginous dressing for a day or two; and a granulating surface treated to daily dressings of Mayer's ointment. A nose or ear that has been frozen rarely sloughs. It may be sore and swollen for a few days, but the inflammation usually terminates by " resolution."

PERNIO OR CHILBLAIN.

A distressing state of the feet occurs in the winter from the effect of cold. Parts affected need not have been frozen, but they have been severely chilled; they appear to be very red and somewhat swollen. The sensation endured is that of itching, tingling and aching. If the sufferer rub or scratch the affected parts, the discomfort and distress are aggravated.

The tincture of aconite root applied by pouring a few drops on the stocking covering the affected part, is quite potent in relieving the itching and pain. Belladonna and veratrum exert a similar influence, and a combination of them does not effect more than either when applied singly. The tincture of hamamelis does some good, so do the spirits of camphor and the tincture of opium, but no lotion I have tried is better than the first named.

ERYSIPELAS.

Erysipelas is a specific inflammation of the skin and subcutaneous tissue. It is not wholly a local affection, but springs from a poison in the blood, and is attended with febrile excitement. One prominent characteristic of erysipelatous inflammation is a disposition to spread. Erysipelas belongs to the severer types of disease, the fever running high, and the local morbid action terminating in abscesses. Not unfrequently the disorder results fatally.

A peculiarity of the disease is the roseate hue which attends the local manifestation, consequently the unprofessional are apt to call every excessive redness of the skin erysipelatous, whether there be inflammation or not. But erysipelas is decidedly an acute disease, there being nothing chronic and mild in its nature. Its local track is not only red, but it is hot, swollen, and painful. The swelling comes from effusions of serum into the subcutaneous cellular tissue. An erysipelatous spot is frequently vesicated, and acrid serum flows from ruptured vesicles or small blisters. The pain is of a burning or stinging character. An attack of erysipelas is frequently ushered in with a rigor or chill, and soon the entire organism becomes morbidly impressed. The secretions are perverted, the pulse is rapid, the breathing hurried, and mental operations are disturbed.

Certain persons are subject to periodical visitations of erysipelas, Spring and Autumn being the seasons when attacks are most common. It is not improbable that a state of indigestion or the presence of undue quantities of urea, have much to do with these repeated onsets.

When erysipelas originates in the system from derangement of some of its functions, the disease is pronounced *idiopathic;* but when it appears in connection with a wound, the peculiarity is designated by the term *traumatic.* But these are not really varieties, for only those who are predisposed to the disease are liable, after receiving a wound, to have erysipelas attack it. When erysipelatous inflammation results in suppuration, it is denominated *phlegmonous* by some authors; and here is a distinction again without a difference amounting to a variety.

Erysipelas is occasionally contagious, and sometimes epidemic. And when the conditions are favorable for the disease to spread, the mucous and serous membranes become affected as well as the skin, so that parturient women are in great peril from metritis and peritonitis; and all traumatic surfaces are attacked or unfavorably impressed. But contagious and epidemic forms, and virulent types of the disease, do not constitute real varieties; on the contrary, they should be regarded as phases of one and the same disease. When traumatic erysipelas prevails, atmospheric influences have much to do with its infectious character. The damp, sunless, and unventilated wards of hospitals are where the disease gains sufficient virulence to diffuse its pestilential qualities, rendering it dangerous for the surgeon to perform an operation in which the skin or mucous membrane is incised. The womb of the parturient woman is temporarily in a traumatic state, hence the connection between hospital erysipelas and puerperal peritonitis.

Persons who are enfeebled with excessive drink and unwholesome food, are more liable to attacks of erysipelas than those who maintain a vigorous condition of health. And certain portions of the body are more capable of manifesting the disease than others. The face is most liable to what are called idiopathic forms of erysipelas, and the scalp, when wounded, is prone to exhibit the traumatic variety, as it has been denominated. There is an erythematous disease of the skin which is characterized by inflammatory action, with heat, redness, and a rapidly spreading state of the affection, which resembles erysipelas, but it is not attended with much constitutional disturbance, nor does it reach as deep as the subcutaneous tissue. An erythema of this kind is not real erysipelas.

When a wound becomes impressed with the poison of erysipelas, it ceases to throw off pus, if in a suppurating state, and discharges an offensive ichor. The inflammation extends to a distance from the borders of the wound, imparting a dusky red to the skin, and producing an œdematous condition of the areolar structures. A gangrenous state is not unfrequently a sequence, with cerebral disturbance, as in varieties of blood poisoning, and typhoid fever. Phlegmonous erysipelas of the scalp becomes dangerous when the parts affected suddenly dry and shrink, and delirium or coma quickly follows.

The swelling which sometimes attends erysipelas of the face, so distorts the features that the patient might not be recognized by the most intimate friends. The loose character of the tissues of the eyelids permits of infiltrations which close the eyes, and temporarily render the patient blind. Erysipelatous inflammation of the nose, mouth, and throat, is in danger of causing such swelling of the respiratory passages that suffocation is imminent.

Erysipelas sometimes attacks crural ulcers, and in its progress arrests purulent secretions or transforms them into ichor; the leg then rapidly swells, and blisters filled with serum form in the cuticle. And if the invasion extend upward, the genitals become involved, and ultimately the peritoneum, rendering death inevitable.

The treatment of erysipelas consists chiefly in sustaining the patient until the force of the disease is spent, and reaction appears, when the tendency to recover is unquestionable. The inflammatory condition is marked by a quick, feeble pulse, brown and crusty tongue, scorched skin, and muttering delirium. These symptoms indicate that the disease is characterized by debility, therefore lowering agencies are out of the question. It is not to be inferred, however, that stimulants and tonics are to be employed from the first. As a febrifuge, aconite may be used to advantage during the early stage of the disease, after which mineral acid and quinia should supplant the aconite. In some instances no acid agrees with the patient, and an alkaline remedy behaves excellently. Dr. Watson makes the following remark in regard to the treatment of erysipelas: "I think the more you see of this disease, the more convinced you will be that it is not to be cut short by any particular mode of treatment; that it will run a certain course." While the disease may not be cut short, its violence may be subdued, and its chief dangers averted, especially if the viscera escape invasion.

The local application of carbolic acid is generally well borne, and its impression often arrests the tendency of the disease to spread. It was once quite in vogue to paint the boundaries of the erysipelatous area with tincture of iodine or muriated tincture of iron; and if a simple erythema existed, the deeper layers of the skin not being reached, an effort to stay the disease by a counter-fire would be rational and practicable, but in most cases of erysipelas the inflammation extends deeper than the skin, hence a superficial escharotic or astringent would fail to strike deep enough to form a barrier against further progress of the invading elements. Carbolic acid does not penetrate to the subcutaneous areolar tissues, but it neutralizes the poison and disarms the power of spreading. If a strong solution be pricked into the skin with needles at a short distance in advance of the invading foe, the power to pass beyond the inoculated line is lost. However, an arrest of the spreading quality of the local inflammation does not necessarily subdue the morbid action. The diversion from original purposes may result in rapid suppuration. The application of stewed cranberries as poultices, is popular with the unprofessional, yet from the repeated use of this remedy I am unprepared to state that it possesses any specific virtues to cure the disease. The artificial redness may cover up the cutaneous flush, or hide it from view, yet the discomfort is not appeased, nor the virus neutralized. Besides, the cranberry stain makes the patient appear like a painted Indian for several days.

The application of "cold cream" is about as agreeable and soothing as any local agent at command. Simple cerate does very well, yet should be spread upon a thin cloth that it may be changed often. Lard, oil, and common greases applied to erysipelatous surfaces mix with the exuded serum, and soon become acrid and rancid. Ordinary tar is worthy of trial as a local application. A mush or bread and milk poultice is generally agreeable to the patient's feelings, yet when employed it should be changed often to avoid fermentation. A piece of old linen wrung from warm water, and quickly applied to the phlegmonous region, is about as comforting as a poultice. It may be advantageous to use on the surface of a poultice a dilute solution of carbolic acid, on account of the antiseptic qualities of the agent; charcoal has been employed for a like purpose. It is of little avail to press into service potato, carrot, onion, and other vegetables as poultices; flax-seed, or slippery elm, is as good as any of them. Warm fomentations of hops, poppy leaves, and chamomile flowers, are agreeable, and as efficient in restoring the local inflammatory action as poultices. A bruised cabbage leaf has been highly recommended, but it performs no valuable office except to shield the inflamed surface, and impart a cooling sensation.

Velpeau, as long ago as 1841, commended the local use of sulphate of iron, in the following terms: "It modifies, it changes very positively, the erysipelatous inflammation; I do not say that it extinguishes it as soon as it is in contact with it; but it is certain that it sensibly shortens its duration, and that an erysipelatous patch does not resist the application of the sulphate of iron for more than two or three days. Treated by this remedy, an ordinary erysipelas, where there is a succession of patches of inflammation, never lasts more than three to six days, whereas the average duration of the disease is not less than twelve days." In 1851, Dr. G. Hamilton Bell recommended the muriated tincture of iron as an external and internal remedy for the successful treatment of erysipelas; and since his paper was published on the subject, the agent has gradually gotten into general use, and is very popular among physicians at the present time. I have employed the remedy in many instances, but have not seen the benefits so often accredited to it. The ferruginous preparations are among the most valuable in the treatment of erysipelas, yet I am not prepared to regard them in the light of specifics.

The internal use of quinia should not be neglected in the treatment of erysipelas; and the addition of sulphurous acid is generally advantageous. Champagne wine is exceedingly refreshing, and commonly improves the patient's general condition. Ice-cream is palatable and nutritious. Lime juice is craved by some patients, yet it is not universal in its applicability. Iced milk and table tea are to be commended for their nutritious and supporting qualities. Meat soups and oyster broths often ferment in the stomach, and do more harm than good, especially in the early or middle stages of the disease.

During the management of a case of erysipelas it may be serviceable to move the bowels when they are sluggish, though the action provoked should be gentle. Podophyllin is too harsh in its impressions. A Seidlitz powder or other saline aperient, is generally active enough, especially if the doses be repeated. In the early phases of the disease emesis provoked with large draughts of warm water and small quantities of ipecac or lobelia, cleanses the stomach and lessens the febrile force. Dr. Rush, in homely language, said that an emetic "shakes the gall bladder, and this followed by a dose of calomel and jalap, clears the ship fore and aft." But it is a mistaken notion that the poison of erysipelas can be hurried out of the system by means of emetics, cathartics, diuretics, or cholagogues. A rational plan is to put the body in a good state to stand the shock of a violent morbid storm.

An essential feature of erysipelas is to spread, and not localize and concentrate its forces enough to produce suppuration; but if the morbid action do confine itself to a circumscribed spot, say to the eyelid when the attack has been on the face, the formation of an abscess presages a happy termination of the disease. Erysipelas leaves a patient exceedingly weak, which shows that the disease is very depressing in its nature; and relapses are very common. One side of the face will sometimes pass through an erysipelatous attack, and quite recover, when the disease suddenly crosses the median line and invades the other side of the face. After a full recovery from an attack of erysipelas the bodily powers seem to be renewed, so that a higher degree of health than common is enjoyed; and when convalescence is fairly established, it is interesting to observe the tendency to revert to that healthy state in which the bodily functions can best be exercised.

During the progress of an erysipelatous attack a depressing diarrhœa may set in, and carry the patient rapidly downward. Such a complication should be promptly arrested with an opiate. And a painful, restless state, which by continued agitation and loss of sleep, seems to be wearing out the patient, can generally be overcome by repeated doses of chloral hydrate. I have employed the following prescription to advantage:

℞ Camphor water. f℥ii.
Hydrate chloral, ʒi.
Sulph. morphia, gr. j. M.
S. Dose, teaspoonful, and repeat occasionally to quiet pain.

A complicated morbid condition of erysipelas is a soreness and swelling of the lymphatics, and phlebitis; and an indication of recovery is when the disturbed lymphatics and veins lose the morbid sensitiveness. Little can be specially done to avert or subdue the complications referred to. Wrappings or coverings of soft lint moistened with camphor water or arnica tincture, are agreeable, and in no respect objectionable.

When erysipelas attacks a wound the parts involved should be wetted every few hours with a solution of chloride of zinc, to neutralize the local virus, and to excite healthy action. I have used a solution of the following strength:

℞ Water, f℥iv.
Chloride of zinc, gr. x.
Muriatic acid, gtt. v. M.
S. External use.

The nitrate of silver has been employed to cauterize an erysipelatous wound, but the agent is superficial in its action, and the virus of the disease strikes deeply. Carbolic acid applied to traumatic surfaces affected with erysipelas, has generally proved efficient in preventing gangrenous sloughs, and in correcting offensive discharges.

DELIRIUM TREMENS.

Among formidable affections of the nervous system is a disease produced by the prolonged and excessive use of alcoholic stimulants, and denominated delirium tremens, or *mania a potu.* The habitual over-use of opium and tobacco has occasionally developed nervous depression and agitation which resemble the maniacal state dependent upon excessive drink. The morbid condition is characterized by delirium, tremor, and insomnia; and it follows the intemperate use of strong liquors, and the withdrawal, through lack of appetite, of sufficient food to hold the nervous system steady. A fit of intoxication may produce emesis, and temporarily disorder the stomach, but it requires a debauch of several days' continuance to so thin the blood through lack of nutrition, that the brain becomes bewildered. Excess of drink and want of food inflame the stomach and render it averse to the reception of the most palatable nourishment. A drunkard's stomach often rejects the morning dram of an accustomed beverage, so that several unsuccessful attempts are made to take a drink before enough of the stimulant is retained to arouse the depressed energies and fit them for the day's potations. The breath of an individual with an inflamed stomach, and about to experience an attack of delirium tremens has a peculiar odor that is indicative of approaching trouble. And when that unmistakable scent in the breath is detected, it is high time the possessor should be warned of the impending danger, and, if necessary, restrained from indulging in the baleful habit.

The moderate drinker is not liable to an attack of delirium tremens unless the ability to take food ceases from some cause, or a fit of despondency is brought on by loss of property or friends. While food is taken regularly and sleep is enjoyed, a large amount of alcoholic stimulants will not develop *mania a potu;* but the vital depression attending diarrhœa, dyspepsia, and mental anxiety, favors an onset of delirium though less than the usual quantity of ardent spirits be taken. Mr. R., was accustomed for years to take eight or ten drinks of whisky a day, and never became intoxicated or incapacitated for business, but during a heated term in June, he went to the country with his son on business of a perplexing character. Upon his return, after an absence of a week, he was attacked with delirium tremens, though the son said his father had not taken over three drinks a day while they were gone. A lack of appetite, intestinal disturbance, anxiety, and unusual hot weather, contributed to the maniacal paroxysm in an individual who constantly drank too much, yet who might have escaped had outside circumstances favored. It is a peculiarity of hard drinkers that they can not endure violent changes without a disposition to drink more than usual, and a tendency to suffer nervous agitation. Good or bad fortune leads to over-indulgence in drink, and to a diminished capacity for digesting food. The victim is often conscious of his weakness, but does not put forth a strong will to resist the temptation. In his better moments he is ashamed of his imbecility, yet fails to correct the evil by sticking to a good resolution. A man with an hereditary disposition to indulge in alcohol stimulants, and who occasionally takes a glass, can abstain entirely, or stop drinking when partially intoxicated, if he has practised self-control, but the weak grow weaker by repeated lapses from moral rectitude; and medical men are not more secure against the weakness than others.

Alcoholic stimulants are indirectly fattening, when taken in moderation, resistance to normal waste being the nature of the nutritive action; and they promptly revive flagging vital powers that have undergone exhaustive efforts. However, alcoholism is not tonic or permanently recuperative in its effects, but decidedly depressing. The daily drinker can not endure the mental and physical strain that can be maintained by the abstemious. Besides, the habit of drinking dulls the ambition and lessens the capacity for close application to study and business.

An attack of delirium tremens is usually preceded by nervous depression and agitation, and inability to sleep. The pulse is quick and excited, the eyes have a glassy stare, the perspiration is offensive, and the mind wandering. After unmistakable mania sets in the patient is alarmed at phantoms, and has vivid impressions of that which is horrible and loathsome. The brain pictures objects which writhe and twist like serpents. The bedclothes seem to be infested with vermin, or conceal cold, slimy, and repulsive creatures. The eyes of the victim stare at shadowy forms, and flash like those of a tortured wild beast. The best of friends are regarded as foes, and confidence is usually placed in only one attendant. Not unfrequently the sufferer will leave the bed at a bound, and vault through an open window, regardless of distance to the ground. Sometimes the mind is haunted with the idea that an assassin's knife is raised to strike a deadly blow; and the maniac will utter an agonizing shriek as if actually hit, or barely saved.

In connection with the delirium there is usually a *tremor*, or unsteadiness of the muscles, so constant and marked, that the disease has taken a part of its name from the complication. The patient can not hold a glass steady enough to drink without spilling some of its contents; nor protrude the tongue and hold it quiet enough for professional examination. He is constantly on the move, though more violently at one time than at another. Often there is an appearance of hurry in all his movements, as if the furies were lashing him to action. Sleep under such circumstances is totally impossible, and the disease grows worse by the havoc it produces.

The treatment of delirium tremens is founded on empiricism, there being nothing indicated by autopsical appearances to lead to a rational or scientific system of therapeia. The disease was once looked upon as an exalted state of the vital powers, and consequently assailed with cathartics, blood-letting, and other lowering agencies. Afterwards the stimulating plan was adopted, the patient being plied with the same drinks which had produced the disorder. Opium, from the fact that it sometimes acts as a sedative, and occasionally produces delirium, has been held in high favor as a remedy. Perhaps it has been employed under the fanciful notion that in medicine there is a law of "likes" and "dislikes," which can be reduced to practice.

The amount of attention demanded for the management of a patient afflicted with *mania a potu*, leads to the use and abuse of certain agents which enforce quietude and sleep. Opium, therefore, has frequently been administered in dangerous and even fatal quantities.

As abstinence from food plays a very important part in the development of the disease, repeated efforts should be made to induce the patient to swallow liquid nutriment. To be sure, the stomach revolts at nourishment, and often rejects the most palatable viands, yet persistent trials generally result in enough being retained to set the digestive machinery in working order again. Milk, cold or hot, is easily obtained, and about as acceptable as any form of food which can be offered. Fruit jellies liquefied in water, form cordials which are easily swallowed and as readily retained as almost any nourishment which can be mentioned. Cold or hot table tea is an excellent stimulant and tonic, and may be employed to advantage. An occasional glass of champagne is decidedly refreshing, and not sufficiently stimulating to provoke and prolong the morbid state already existing. Ice cream is inviting and nourishing. Hot soups and gruels are easily prepared, and sufficiently nutritive for an invalid. Bits of ice allay the gastric irritability, and they are generally swallowed with avidity; but water alone will not enrich the blood, and thereby allay the delirium: food in some form must be digested and assimilated.

In many instances the disease seems to be aggravated by the sudden withdrawal of an accustomed stimulant, therefore it may be judicious to allow small quantities of whisky to be taken at stated intervals to avoid the effects of a too sudden revulsion. At night a dose of morphia or chloral, or the two combined, usually allays restlessness and invites sleep. The following combination is the one I usually employ:

℞ Peppermint water, f℥ij.
Hydrate of chloral, ʒij.
Sulphate of morphia, gr. ij. M.

Dose, a teaspoonful every two hours until the desired effect is produced. If the patient be very wild and unmanageable, the medicine may be given in teaspoonful doses every half hour, yet withheld as soon as agitation of the nervous system is allayed.

The nurses and attendants should employ no coercive measures, but treat the patient kindly, though with a decision calculated to command respect. If the patient once gets the attendants in fear of him, he will exercise the supremacy in a way not pleasant to those having him in charge. It is often best to agree in some particulars with the maniac, in order to preserve his confidence. Contradiction and a pugnacious opposition beget anger, and add fuel to the flame. The struggles of a patient in a straight-jacket have not unfrequently resulted fatally.

The hypodermic use of morphia and chloral is attended with happier effects than when the medicines are taken into the stomach, yet care must be exercised to avoid overmedication in this way. Fatal results have followed the subcutaneous use of even small quantities of morphia. The object to be obtained by employing sedatives hypodermically, is to avoid throwing medicines into an irritable and inflamed stomach.

Digitalis has been extolled as a specific in the treatment of delirium tremens, yet I have not learned experimentally that a satisfactory result can be produced with the agent. Indian hemp is another agent recommended, but its effects in *mania a potu* are not to be depended upon. When a patient will take nothing, and is bent on injuring himself or others, chloroform by inhalation may be forced upon him until subdued; and then he may be kept under restraint by the hypodermic use of morphia and chloral.

A patient wild with delirium tremens is exceedingly disagreeable to manage. The maniacal condition does not yield readily to any treatment, therefore personal and professional attendants get worn out with care and watching. The fact that the patient has foolishly brought the unwelcome condition upon himself, is not calculated to arouse the sympathies of friends. And a man who has unwittingly allowed himself to fall into one fit of delirium tremens, and who, having been rescued, does not avoid another attack, is not deserving the attentions which pity called forth in the first instance. Alcoholism is a disease, but from its allurements the victim, in its earlier stages, by the exercise of becoming resolution, can emancipate himself.

SEPTICÆMIA.

Blood poisoning was once designated by the term pyæmia, which signifies pus in the blood; but the admixture of putrid material with the blood is now called septicæmia. Pus-cells are too large to enter undivided vascular walls, but they can pass into the open mouths of incised veins after amputations, and they can find their way into the uterine sinuses after parturition. Surgical operations often leave divided veins in contact with purulent fluids. Besides, in phlebitis, pus is actually developed along the lining membrane of the inflamed veins.

If pus be injected into the veins of healthy animals, it can not be found until the capillaries on the arterial side are reached, and then the pus-cells, being too large to pass through, lodge and form obstructions. Pus will circulate with the blood, but not become incorporated with it. Those microscopists who claim to have detected pus-cells in the blood, have probably been deceived, the white corpuscles of the blood having been mistaken for them.

The introduction of a minute quantity of dead and decomposing animal matter into the circulation, acts as a ferment to produce putrid changes in the entire circulating fluid; and the poison elaborated or developed so intensifies with vital operations, that rigors, vertigo, and great uneasiness follow. The blood loses its bright color, as manifested by the veins showing dark purple currents, and the skin a dusky hue. The lymphatics and their associated glands partake of the virus, and become painful and swollen. The blood rapidly gets so thin that it is exuded upon mucous surfaces, and produces purging or vomiting. Great prostration attends the morbid changes, so that syncope and dangerous sinking are not uncommon. In some instances a low febrile state continues for several days, or even weeks, and the patient dies without any positive or special cause. If the patient can be sustained long enough for recuperative changes, the virus is gradually eliminated by fluxes or discharges of various kinds, and a gradual return to health is manifested. During convalescence, the fermenting or poison-developing process returns again and again, temporarily depressing the patient, and baffling the best directed efforts of the physician; consequently the period of recuperation is prolonged and discouraging. In milder types of the disease, the morbid career presents the usual phases of typhoid fever, which perhaps is a form of systemic infection, or septicæmia.

Blood poisoning from the introduction of decomposing animal matter into the circulation, is observed in the course of carbuncular inflammations, also in connection with the development of malignant pustule and phlegmonous erysipelas; consequently, these diseases are attended with more or less danger. Only those who have had experience in the management of these morbid manifestations can appreciate the cause of the vital depression, and the tardy recuperative action.

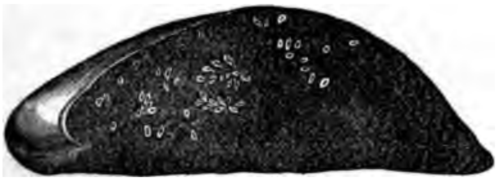
The chief reason why miscarriages are more dangerous than ordinary parturition, comes from the fact that in ordinary labor the womb is quickly freed from placenta and coagula, while an abortion taking place during the early months of pregnancy, is rarely complete, the uterus retaining a part or the whole of the placenta, and more or less clotted blood, to decompose and spread infection. If a woman carry a dead child in the womb until it is putrid and the placenta rotten, she is likely to become infected with putrescent animal matter, and suffer or perish with septicæmia. Surgical wounds often develop poisons which are in danger of being imbibed or absorbed by traumatic surfaces. Especially is this the peril in hospitals, camps and barracks, where anæmic effluvia abound. In the Crimean war, according to Monnier, no pyæmia was noted among the first two thousand amputations, whilst afterwards it became of quite common occurrence, associated with erysipelas, gangrene, and typhoid fever. Surgical operations of magnitude are safer in the country where the air is pure, than in the hospitals and crowded apartments of a city.

Some patients who are not particularly robust, possess the power of resisting the encroachments of blood poisoning to a greater degree than others who are seemingly strong and hardy. However, the debilitated, whether from excesses or morbid states, are decidedly the most liable to receive blood poison and succumb to its influences. It requires great constitutional stamina to pass through an attack of septicæmia.

In cases of phlebitis, clots form in the veins, and obstruct the onward flow of blood toward the heart; and œdematous infiltration ensues, as in other instances when the veins are occluded. Although coagula have been discovered mostly in the larger veins after death, there is reason to believe the smaller vessels become obstructed with coagulable material. The decomposition of clots may become an additional source of blood poisoning, which constitutes a "secondary affection."

Profuse and exhaustive perspirations are common during the progress of mordid action attendant upon septicæmia, and the sweat is generally offensive. Discharges from the bowels are accompanied with the escape of an abundance of mephitic gas. Evacuations from the bowels seem to be necessary to free the body of decomposing material, though the serum escaping at the same time is a source of exhaustion.

FIG. 24.



Secondary corpuscular matter deposited in the liver.

Secondary deposits of lymph, corpuscular matter, and clots, take place in the lungs and liver; and secondary effusions occur into serous and synovial sacs, as the pleural cavities and the larger joints. Secondary abscesses form in various structures, and pus is discovered in loose cellular tissue near the large veins, in the thoracic cavity, and in the substance of the liver.

The management of a case of septicæmia or blood poisoning requires the greatest prudence and skill. If septic virus enter the circulation at a wound an effort should be made, if the poisoning be known soon enough, to arrest its progress or to weaken its influence. The topical use of carbolic acid should not be neglected, and chlorinated washes are to be remembered as possessing antiseptic properties.

12

[illegible] quinia and mineral acids should be administered. [illegible] has the reputation of exerting a neutralizing [illegible] animal poisons in the blood, yet I have not learned [illegible] that the agent is as efficient in that particular as [illegible] acid and sulphate of quinia. In bad cases of septi-[illegible] the influence of secondary abscesses, or the develop-[illegible] in the substance of the uterus, liver, or lungs, or the [illegible] deposit of pus in the areolar tissues of the deeper parts [illegible], it is highly probable, from various experiments and [illegible] experience, that no antiseptic is potent enough to save [illegible]. The poison is gradually eliminated through the skin, lungs, kidneys, and intestinal track, therefore if the patient can be kept [illegible] long enough to get rid of the devitalizing material, a recovery is assured. However, when the blood is once contaminated, a small quantity of virus uneliminated is capable of acting the leaven to re-poison blood which has become almost pure. Relapses, then, may be expected in cases which for a season seem to be doing well. I have observed a relapse to occur every seven days until four were witnessed in one patient. The paroxysm of depression was attended with diarrhœa and profound stupor. After a depressed turn had lasted about thirty-six hours, the diarrhœa and clammy perspiration became checked, the intellect cleared, and a season of recuperation set in. Each relapse was milder than its predecessor, and the patient ultimately recovered.

To allay the gastric and intestinal irritation usually attendant upon septicæmia I have found the following prescription to produce beneficial effects:

℞ Essence peppermint,
Spirits camphor,
Tinct. prickly ash,
Tinct. opium, aa. f℥ss. M.

[illegible] to fifteen drops in a half wineglass of water, and repeat every hour or two.

Turpentine liniment rubbed upon the abdomen is excellent to arrest decomposition in the intestinal track. The vapor of the terebinthinate reaches the air passages, and favors easy respiration, as well as excites activity in the kidneys.

Whisky as a stimulant to be used during turns of depression is better than brandy. Champagne is excellent on account of its reviving and refreshing qualities. Ice-cream is exceedingly palatable, and rarely does harm. Milk is to be used as a general article of diet, and administered either hot or cold. It is always best to feed the sick with food as hot as can be endured; and to furnish drinks as cold as ice will make them.

As little opium as possible should be employed in the management of septicæmia; and generally little is required to allay pain. The opiates are worth something to restrain exhausting diarrhœas, but their continued use for such purposes generally results in harm. A solution of the extract of logwood, made moderately strong by dissolving the resin in warm water, is an agent of great value in the arrest of diarrhœa. In a case of septicæmia following measles which did not erupt well, I am confident logwood saved my patient. The diarrhœa was violent, and ordinary remedies passed the bowels without being acted upon. The first dose of logwood appeared in a stool at the end of an hour, but less intestinal fluid escaped than at previous passages. In the course of a day after the remedy was administered the patient was out of danger.

The arterial sedatives, so called, as aconite, veratrum, and gelseminum, exert no beneficial influence in the treatment of septicæmia, and often do harm. Nux is useful to better the condition of the stomach, but the digestive powers are often so enfeebled that nothing will provoke the peptic functions. The following prescription I am in the habit of using to promote digestion and to arrest decomposition of the blood:

℞ Water, f℥iii.
Sulphate of quinia, grs. xii.
Hydrochloric acid, gtt. x. M.
S. Dose, teaspoonful every three hours.

I have employed pepsin with some indications of benefit; and believe it an agent of value in the treatment of septicæmia.

When secondary abscesses form, they are to be opened, and their contents evacuated; and it may be well to syringe the cavities with antiseptic lotions. I have injected the fluid extract of pinus canadensis into spaces recently the seat of secondary purulent collections.

A patient greatly reduced from the effects of septicæmia, is in danger of dropsical effusions, albuminuria, and other complications of an unpleasant character, therefore a condition of safety is not to be announced until substantial health is unquestionable.

GANGRENE—MORTIFICATION.

When a part of the organism dies rapidly through the influence of disease or injury, the dying process is called gangrene or mortification, both terms meaning about the same. If a part be thoroughly dead, it is mortified; and while the change is taking place the structures immediately involved are in a state of gangrene. A finger or toe which is turning black, cold, senseless, and lifeless, may be declared gangrenous, as if the term signified *incipient* mortification; and later stages, indicative of sphacelus, represent complete mortification.

While an ulcerative action is going on, minute particles of flesh are lost by death and disintegration—mortification is actually taking place, but no slough or mortified part is perceptible. Gangrene and mortification, then, are terms used to denote a rapidly dying process, which proves exceedingly destructive, or even fatal, if not quickly arrested.

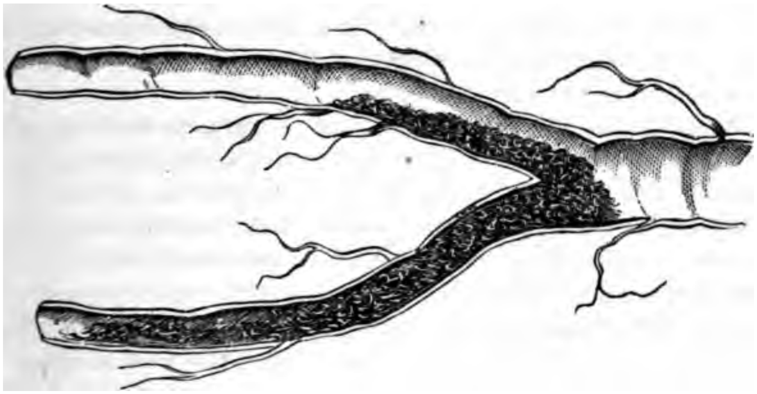
Molecular disintegration and sloughing may go on without producing much constitutional disturbance, the patient being able to attend to his usual avocation, but as soon as gangrene sets in the pulse rapidly sinks, a cold sweat appears, the strength fails, and the countenance assumes an expression which betokens physical disaster.

Gangrene generally arises from arrest of circulation in a part; a knuckle of strangulated intestine becomes gangrenous through constriction which interferes with the circulation; a broken arm often takes on gangrene through the compression of a bandage which impedes the circulation; a leg may mortify because the main arteries of the limb have been bruised, lacerated, or obstructed; and a part of the organism which has been severely burnt or frosted, may have had the circulation blocked to an extent that gangrene results. Embolism, or the plugging of a vessel with a clot of fibrine, and thrombosis resulting from the deposit of atheromatous material, may produce mortification. Senile gangrene, so called on account of its appearing oftenest in advanced life, is a common sequence of embolism or thrombosis.

The disease and injury of important nerves, and nerve centres, may be followed by ulceration, sloughing, and even gangrene. Paralysis, and injuries of of the spinal cord, are not unfrequently succeeded by sloughing bed-sores, and gangrene of the lower extremities.

The nerves exert an important influence over the circulation of the blood. Disease of the ophthalmic branch of the trigeminal nerve may be attended with ulceration and sloughing of the cornea. A severe injury of the large nerves of a limb may so decidedly interfere with the circulation that gangrene ensues. Nerve influence is necessary to functional activity.

FIG. 25.



Embolism or plugging of the popliteal artery at its bifurcation.

Defective nutrition is known to be followed by mortification, as illustrated in those who feed upon "spurred rye" and black wheat. The parts of the body first affected in those who live upon ergot, or blasted wheat and unsound corn, are the feet and legs. The disease commences in the lower extremities and manifests itself by the legs and feet becoming insensible, cold, dry, withered, and shrunken. In this form it is called dry gangrene, as distinguished from the moist variety which follows injuries, and in which there is an abundance of humidity.

Traumatic gangrene is that kind of local death which springs from wounds or injuries; *senile* gangrene, as already stated, comes from calcification of the arteries, atheroma, and thrombosis; *hospital* gangrene is peculiar to soldiers, prisoners, and inmates of eleemosynary institutions.

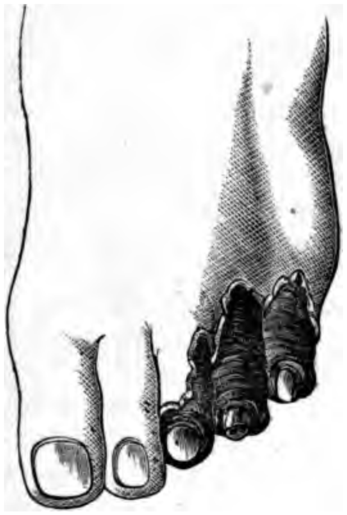
In private practice a case of what is called hospital gangrene is occasionally met. The disease arises from unwholesome surroundings, therefore it need not require a literal "hospital" for its production. Bad food, cold and damp apartments, foul odors, lack of cleanliness, and despondency, are provocatives of the morbid state; and all these conditions may be found in the tenement houses, barracks, and inhabited cellars of a large city. The disease is highly contagious and, to a certain extent, infectious. All fibrous textiles once contaminated, do not readily part with the contagious property, hence cloths once used upon a patient laboring under the disease, should not be employed about another patient having a wound of any kind, though the fabrics be thoroughly washed and ironed. The offensive odor arising from hospital gangrene penetrates to adjoining rooms, and infects the wounds of quite robust patients. Even females recently delivered are subject to the infectious influence, if not domiciled in quarters remote from the dense effluvia.

When the virus of hospital gangrene invades the wounds and ulcers of debilitated and typhoidal patients, the secretion of laudable pus is arrested, and a thin, sanious fluid is substituted. The borders of the infected sore become livid to quite a distance around, and grayish spots appear in the discolored areola. Inflammation exists, but the morbid process is very destructive. Large sloughs form, and in an astonishingly brief period the patient is reduced to a moribund condition. Hospital gangrene seems to be closely related to phagedenic erysipelas, malignant diphtheria, and other forms of putrid morbid action.

The appearance of a limb affected with traumatic gangrene is marked and unmistakable. If the morbid state be in the arm, the fingers are swollen to their utmost, and the knuckles seem puffy; vesicles of putrescent serum are abundant, and there is an escape of putrefactive odors, so that a person coming near or entering the room where the patient is, will detect the character of the morbid state by the sense of smell. No pulse can be felt, the limb is cold, and through the pallid cuticle the livid discoloration of parts beneath can be plainly seen. Where the gangrene ceases the healthy parts exhibit inflammatory activity, and sometimes reveal a red or pink boundary which has been called "the line of demarkation."

The treatment of traumatic gangrene consists in removing the cause as far as practicable, and supporting the patient with nourishment and stimulants. If a tight dressing has provoked the disease, all constriction or compression is to be laid aside, and the gangrenous part is to be wetted with dilute carbolic acid. A covering of lint or cotton-wool is serviceable in preserving an equable temperature. Although the part has a livid hue, and vesicles of offensive serum are abundant, there may be a suspension of animation, and resuscitation is possible. At any rate, it is rarely necessary to resort to amputation, when that extreme measure is contemplated, until it be certain that the affected part is devitalized beyond a reasonable hope of recovery. In some instances it may require a day or two to determine whether the gangrene be superficial or deep, and just where its limits may be. When the dying process is progressive, and will probably extend to a joint, say the elbow or shoulder, if the hand and forearm be invaded, an amputation may stay further progress of the disease. In performing the amputation it is not always judicious to wait for the line of demarkation to form; nor is it generally advisable to attempt to remove all parts which exhibit discoloration. I once amputated the arm of a boy at the elbow, and saved all above, though a livid discoloration extended over the entire pectoralis major muscle. I think mortification would have reached the shoulder joint if the amputation had not been timely performed, as the dying process exhibited a disposition to spread rapidly. While a student of medicine I watched a similar case of traumatic gangrene while the surgeon waited for the line of demarkation to form. At length the line did show itself, but an expert surgeon who was invited to do the amputation, refused to

FIG. 26.



Gangrene from frost bite.

operate on the ground that the vital depression exhibited by the patient did not warrant an operation. However, the patient survived a voluntary separation of the arm at the shoulder joint, and recovered; and the stump was more shapely than if fashioned with the knife.

When the line of demarkation forms, the vital processes have begun a voluntary amputation; and if let alone, will complete the separation, the bones becoming disarticulated at the nearest joint. And to use the knife is merely to hasten what nature has prominently in view.

A finger may become gangrenous, and lose most of its soft tissues by sloughing, yet take on a new fleshy covering through the agency of granulations. However, if it be probable that the work of repair will be imperfect, leaving the digit deformed and useless, an amputation at a point where the stump will not be troublesome, is justifiable. If the insertion of the point of a slender knife inflict no pain, and start no blood, the evidence of mortification is reliable.

A foot which becomes gangrenous after being crushed, burnt, or frozen, generally has to be amputated, though there need not be undue haste in the performance of the operation. It is commonly safe to wait until the line of demarkation exhibits itself; however, if a disposition of the disease to extend up the leg show itself, it should be promptly followed by amputation through tissues which have vitality left in them.

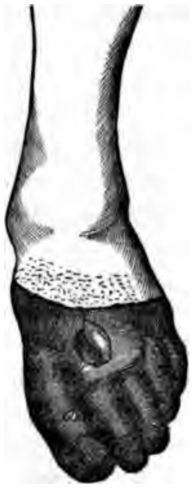
In the management of gangrene the topical use of carbolic acid has been extolled; and the agent is not without valuable properties. It corrects the fœtor, and tends to arrest decomposition. But no agent can be expected to restore life to a part actually dead. Poultices should not be employed unless made of substances which correct the fœtor, as charcoal is said to do. Stimulating applications, as tinctures of myrrh and kindred agents, may be employed with the expectation of their doing more good than harm.

A solution of salicylic acid and borax is excellent to correct fœtor, and to prevent putrefaction. In humid gangrene salicylic acid should be sprinkled upon all parts that are moist, and upon partially detached sloughs.

The internal treatment consists of nourishment, bitter tonics, alcoholic stimulants, mineral acid, and opium or chloral. The food should be adapted to the case; in the event of thirst and nausea nothing would be more agreeable and refreshing than ice-cream; fruit jellies made into cordials by mixing them with water, are well received; beef-tea and animal broths are often to be commended; champagne and even still wines are not to be neglected when mild stimulants are required; states of great depression are to be fought against with liberal supplies of whisky. Quinia, iron, and mineral acid, in combination, or used separately, will sustain the flagging vital powers, and neutralize animal poisons which may have been absorbed. Great pain is to be subdued by the judicious use of anodynes.

Hospital gangrene is to be managed by getting the patient into an uncontaminated atmosphere, and by the free administration of whisky; also, by the local use of escharotics. A patient afflicted with hospital gangrene will not do well except ventilation be free and the air pure. Barrack-hospitals are no longer in good repute, but an approach to tent-life is being substituted for the old fashioned castles of pestilence.

FIG. 27.



Hospital gangrene.

A gangrenous sore of the infectious or "hospital" variety should be wetted, syringed, or injected with a strong solution of carbolic acid, or an escharotic solution of chloride of zinc. If the latter be used, two drachms of chloride of zinc should be put into four ounces of water, a few drops of muriatic acid being employed in the mixture to make it clear. This solution is to be applied to the wound or slough with a swab two or three times a day.

A drachm of bromine dissolved in four ounces of water makes a valuable application for gangrenous sores of all kinds. The agent was first employed by Dr. Goldsmith in the late war; and it proved more efficient in averting gangrene, and in arresting its progress than any remedy before in use. It is an excellent disinfectant and deodorizer. A solution of permanganate of potash has proved efficient in arresting the progress of gangrene, so has a dilute tincture of iodine, and the oil of turpentine. Nitric acid has proved an agent of value in the treatment of gangrene, though none of the topical applications mentioned are so decidedly beneficial as a solution of bromine.

The treatment of gangræna senilis is not generally attended with satisfactory results. The disease commonly begins in a toe, a black slough forming very slowly, and extending gradually to the foot and leg. This process of mortification may be arrested by the application of a strong solution of sulphate of zinc, carbolic acid, or bromine, yet the cause depending upon ossification or obturation of the arteries, little benefit may be expected from any kind of treatment. The pain attending the progress of the dying process is usually severe, and must be allayed by the hypodermic use of morphia, and the internal employment of large and frequently repeated doses of chloral hydrate. The unexperienced may be tempted to amputate at some distance above the gangrenous parts, yet a case is rarely saved by the operative procedure. If an amputation is performed, it should take place through the calf of the leg or the thigh, where the arteries may be free of ossification and atheromatous deposits.

Senile gangrene rarely is arrested by a line of demarkation, but the disease gradually extends up the limb, to the trunk, when the patient rapidly sinks and dies. While traumatic and hospital gangrene hurry a victim out of the world in a few days, the subject of the senile variety of the disease may live for months. One case that came under my observation had the disease arrested by the influence of sulphate of zinc, so that a year of moderately good health was enjoyed. Then a dark, purple spot appeared an inch above the original slough, and in a few days a bad smelling ulcer formed, which spread to adjoining toes and to the middle of the foot. An amputation was performed at the middle of the leg, but the patient never reacted, and died in two days after the operation. While the amputation undoubtedly hastened the fatal issue, it gave the patient the only hope of a renewed lease of life. The dying process was spreading rapidly, and would have terminated disastrously in a week or two at farthest.

I once amputated both feet in a case of what seemed to be senile gangrene, the disease having invaded all the toes, and to a short distance towards the instep. The patient, a woman, was about sixty years of age, and was otherwise in good health; and no cause could be assigned for the disease. It was of the dry variety, the parts attacked becoming desiccated and shriveled as fast as the mortification progressed. An unpleasant odor arose from the mummified toes, yet it was not so offensive as that coming from humid gangrene. The living flesh near that which was wholly mortified, appeared purple, congested, and unhealthy, yet a marked discoloration did not extend more than an inch above the dead line. Chopart's amputation was performed, and the wounds healed in a few weeks without evidence of gangrenous interference. If the patient had been scorbutic, or had fed upon unsound wheat or rye, I might have had a case of dry gangrene coming from unhealthy food, but there was no assignable cause except that of advanced life. The patient had some cardiac disease, yet not seemingly of a character or quality to be attended with gangrene of the extremities.

Elderly persons who are on the point of having senile gangrene, may cut or cauterize a corn, and then have mortification set in directly at or near the spot; and they may ascribe all the trouble to the simple operation. But every experienced practitioner knows that the local irritation produced by the cutting or cauterization was only the exciting cause and not the real origin of the disease. However, the application of nitric acid, lunar caustic, and other well known corn escharotics, may provoke a grade of inflammation which may result in a slough, and actual mortification. Frost-bites in the feet of the aged are frequently followed by gangrene, and fatal terminations, while the young and the robust may suffer a worse freeze, and escape mortification.

CUTANEOUS DISEASES.

Diseases of the skin are common and varied, and generally difficult to cure. The hair and nails are modifications of the cutaneous structure, therefore derangements of them are allied to dermic disorders. The skin has several anatomical elements, consequently its diseases would naturally assume a versatile character. The epithelial or epidermic layer of the integument may be the seat of a purely local affection, which would need only topical applications for a cure; but a morbid condition of the deeper layers of the skin and of the subcutaneous tissue, is usually constitutional, and to be subdued by the judicious employment of internal remedies. Writers upon dermatology have seemingly labored to make as many varieties in the nomenclature of skin diseases as possible; and the distinctions drawn are so technical that the ordinary reader fails to comprehend much beyond what passes as a "cutaneous eruption."

[illegible] or specific remedy for every phase of [illegible] might be advantageous to recognize every [illegible] at sight, and to be able to give the scien[illegible] many of the pathological distinctions so care[illegible] drawn, have no real foundation, and exist [illegible] the specialist. Eczema, for instance, pre[illegible] phases, yet each is not a separate disease, re[illegible] course of medication.

[illegible] purely local affections of the skin, which no [illegible] treatment than is required in the destruc[illegible] yet the great majority of skin diseases do not [illegible] disorders in general, and can only be removed [illegible] several of the internal organs, as the [illegible] kidneys. It has been found that derange[illegible] lymphatic system have much to do with the career [illegible] diseases. Urticaria, "hives," or "nettle-rash," [illegible] constitutional affection; yet its manifestations [illegible] skin, and at such irregular periods that little [illegible] in regard to its essential character and modes [illegible] It may be purely a local affection, but is probably [illegible] manifestation of a constitutional state. Derangements [illegible] and bowels are thought to provoke the evolution [illegible] yet persons seemingly in perfect bodily health oth[illegible] suffer from attacks of "hives." No specific remedy [illegible] discovered, which vanquishes the disease. The [illegible] alleviated by the local and internal use of chloral, [illegible] is not lasting. Cooling anodynes afford temporary [illegible]

[illegible] diseases are those in which there is a hyper[illegible] of the cutis, like a *rash;* erythema, roseola, and urti[illegible] to this class of cutaneous disorders. The charac[illegible] manifestations are red patches, which disappear under [illegible] The roseola and erythema of children are presumed [illegible] constitutional forms of disease, yet not of a serious nature. [illegible] stomach, and a skin kept clean with unirritating soaps, [illegible] inimical to all the exanthems. Emollient appli[illegible] have done good service in aggravated or perverted patho[illegible] states; as well as the employment of laxatives and cor[illegible] stomachics.

[illegible] is a hydra-headed monster oftener met than all other [illegible] affections counted together; it bears the common names of salt rheum, tetter, bakers' and barbers' itch, scald head, etc., etc. The disease is characterized by the eruption of small vesicles in patches or irregular groups, with a tendency to form scabs, crusts, or scales. The patches extend on one border, and perhaps dry up on another, the action producing the appearance of a sliding or creeping of the disease. The serum and thin pus discharged from the vesicles form a crusty covering, under which the fluid seems to burrow. When the vesicles are small, and the thick skin exposed to chafing and evaporation, cracks form, through which an alkaline serosity oozes. The skin thus affected is stiff and sore, but troubled most with itching sensations. Eczematous patches upon the face are hot, red, and swollen, their borders being raised into ridges. In some instances the welt of induration is in the skin and subcutaneous tissue, there being no elevation above the common level of the integument.

All parts of the body are not equally liable to eczematous invasions; the scalp, the face, and the arms and legs, especially about the joints, are oftenest attacked; the scalps of strumous children take on fearful encrustations, while in adults there may be no scabs or crusts, but an abundance of furfuraceous scales. Eczema in the beard is exceedingly obstinate, though it is rarely annoying except so far as appearance goes. It may occasionally burn, tingle, and itch, yet such sensations are exceptional. Men with eczematous blotches about the face, declare that the disease was caught in a barber's shop, from the contact of an impure lather brush; but it is doubtful if this form of eczema is contagious.

Tinea capitis so often attacks several children in one family that the affection has been pronounced contagious. Possibly the conditions were favorable in each child for a development of the same disease.

Eczema of the anus, labia pudendi, and scrotum, is attended with the most troublesome itching, especially in the aged. Women in middle life who suffer from irregularities of the catamenial function, and from irritating leucorrhœal discharges, sometimes have to suffer the most intolerable itching in the external genitalia. The distress is the more hateful because it has to be endured without attempts at relief. Eczema of the lower extremities often depends upon a varicose condition of the veins.

The treatment of eczema taxes the patience and ingenuity of the experienced dermatologist to the utmost. Salves and ointments in multitudinous variety, have been devised to cure obstinate cases; and in rare instances the disease is incurable. In the majority of cases only topical applications are needed to keep the affection subdued. The following prescription has been employed with great success:

℞ Simple cerate, ℥j.
Citrine ointment, ʒiij.
Oil bitter almonds, gtt. vj. M.

This unguent is to be rubbed upon eczematous patches twice a day, whether on the scalp, behind the ears, or on other parts of the body.

A mixture of glycerine and Fowler's solution, an ounce of the former to a drachm of the latter, will generally remove furfuraceous scales from the scalp, and cure "bakers' or grocers' itch" on the arms.

"Cold cream" and Fowler's solution, an ounce of the former and half a fluid drachm of the latter, make an elegant pomade to use on young children and delicate females. All soaps employed in cleansing the skin should be of the best varieties. There is no necessity for cutting off the hair, and poulticing the scalp, as advised by Hebra, in the treatment of tinea capitis. Cod liver oil has been highly recommended as an application, in the management of the eczematous scalps of children, but I have not obtained much benefit from its use.

The following combination, which I prescribe under the name of "juniper pomade," is a valuable agent in the treatment of eczema:

℞ Lard, ℥vj.
Paraffine, ʒiv.
White wax, ʒj.
Oil juniper berries, fʒiij.
Fowler's solution, fʒij.
M.

This cerate is rather elegant in its physical properties, and excellent as a subduer of eczematous manifestations.

A glycerole of lead prepared as follows is a valuable preparation to be employed in chronic eczema:

℞ Acetate lead, ℥j.
Litharge, ʒiv.
Glycerine, f℥xij. M.

Heat for half an hour, stirring all the time, and then filter while warm.

This is too strong to be used as thus prepared, but may be kept as "stock," from which a drachm may be drawn to add to an ounce of glycerine. This is strong enough for ordinary cases, though all persons do not require a medicine of a fixed potency. This preparation, in many cases of both acute and chronic eczema, is more efficient than any of the others mentioned.

The benzoated oxide of zinc ointment in common use possesses some value as an external application in eczematous affections, but is less efficient than the glycerole of lead, the composition of which has just been given.

The leading constitutional remedies to be used in the treatment of eczema, are iodine, sulphur, arsenic, phosphorus, iron, and the mineral acids. Iodoform in grain doses, in sugar-coated pills, is a potent agent to overcome the systemic taint in obstinate skin diseases. It is to be noted that the above agents are not to be given in mixture or combination, but singly, on different days. The vegetable alteratives, so called, are of some value, but will not accomplish much unless the iodides are mixed with them. There are various mineral springs in different parts of the country where patients with troublesome skin affections have obtained substantial relief. A wealthy gentleman of my acquaintance, who had suffered inexpressible torture from eczema of the scrotum, and who could only get a few hours sleep when tar was applied to the itching and stinging surfaces, visited the Hot Springs of Arkansas, and obtained a veritable cure.

Herpes is a vesicular disease which is regarded by dermatologists as distinct from eczema, and several varieties of the affection are described. The vesicles of herpes are large in comparison with those of ordinary eczema, and the patches appear mostly on the cheek, lips, and prepuce. Herpes zoster, or "shingles" as vulgarly known, begins in a small oval group or patch on the back or side, and extends in a semicircular track towards the middle line of the chest or abdomen, as if bent on girdling the trunk. Although regarded as a formidable disease, it rarely does much harm. The sulphate of copper applied to the semicircular track will generally subdue the affection in a few days. Mayer's ointment has effected satisfactory cures.

Herpes circinnatus, or ring-worm, is another phase of the disease, and is to be managed like herpes zoster, *i. e.* by the local application of sulphate of copper. Various remedies are in good repute as curative agents, and it is highly probable, from the great number of cures cited, that scores of agents will accomplish good results. In fact, the disease frequently subsides when no treatment is employed.

Psoriasis is a vesicular skin affection which is characterized by its appearing in annular patches, with a covering of furfuraceous scales. Dermatologists describe ten or fifteen varieties, but attempts to draw so many distinctions are perplexing and unsatisfactory to the general practitioner. I am inclined to regard psoriasis as a species of eczema; and practically there is little gained by multiplying varieties of disease unless some advantage can be gained in the management of them. Psoriasis is usually controlled by the remedies known to subdue eczema and herpes. A very weak solution of corrosive sublimate, topically used, will sometimes overcome the affection quicker than unguents. The local use of arsenicals and mercurials, has commonly accomplished more than ointments of lead, copper, and zinc. Chrysophanic acid is an efficient topical application.

There are several varieties of skin disease which are produced by the presence of vegetable parasites. *Tinea tonsurans* is an affection which appears in the hair and scalp of children. It exhibits itself in patches, and seems as if the hair had been snipped with scissors at a distance of two or three lines from the rough scalp beneath. The patches of diseased hair and scalp appear dry and scorched like " fairy spots " on the prairies, and have a similar origin. The short hairs are stiff, and wanting in lustre; their follicles are embedded in scalp covered with small scales. Microscopists have discovered a minute plant which flourishes in the root of the hair and its sheath; the parasite renders the hair brittle, so that it breaks off near the scalp, thus making it appear as if cut short in patches. It is possible that the parasite is not the cause of the disease, but fixes itself in the debris of an eczematous or herpetic affection, as a sequence, for the trichophyton tonsurans, as the parasite is called, is occasionally found in herpes circinnatus. The disease is contagious under favorable circumstances.

The treatment of the tinea tonsurans is generally successful when eight or ten grains of corrosive sublimate are added to an ounce of simple cerate, and the mixture used as an unguent; a drachm of acetate of copper rubbed into an ounce of lard, has effected cures; a strong solution of carbolic acid will destroy the parasites, but leaves the scalp rough and scaly; Fowler's solution with glycerine, a drachm to the ounce, will bring about a cure, so will sulphur ointment, and applications of sulphurous acid. Citrine ointment is among the most certain of the remedies named.

Pemphigus, sycosis, and *rupia,* are regarded by dermatologists as parasitic affections, a microscopic plant flourishing in the epithelium, and hair follicles. These diseases are characterized by disorder of the skin in spots and patches, and by the presence of scales and scabs. They commonly attack those individuals who are debilitated by excesses, poverty, and squalor; and are rarely cured unless the habits of body be improved. Local remedies may accomplish something beneficial, yet the internal use of the iodides of ammonium and potassium will be needed to complete a cure. Sulphur baths have effected much good, as well as the internal use of sulphur.

Impetigo is a pustular disease of the skin, the pustules appearing singly and in groups. Crusts form from the drying process; and when these fall off, and are forced out of place, a raw surface is exposed, with pus and specks of blood. The lymphatic glands in the vicinity are tender and enlarged. Impetigo is attended with itching and stinging sensations; and is unsightly. It is peculiar to children, and generally attacks the scalp, lips, and face, though the hands and other parts of the body are not wholly exempt.

The treatment which is efficient in the cure of eczema and herpes, is generally successful in the management of impetigo. Mayer's ointment is sufficient in many cases, while an instance will occur now and then, without any known cause, in which zinc, lead, and copper unguents will do no good, and a mild mercurial ointment acts like a charm. Even the vegetable ointments will cure some cases of impetigo. Sulphur ointment is a common domestic remedy, and is used with success upon impetiginous ulcerations. Besides external applications, it is well to use mild aperients and alteratives. The tasteless syrup of iodide of iron will generally be found to do good service. Cod liver oil is highly commended, and when it does not disagree with the stomach, there are few better remedies.

Porrigo and *ecthyma* are varieties of pustular cutaneous affections, and related to impetigo. The pustulations, isolated and in groups, sustain a crust or scab, and, from absorption of the purulent fluid beneath, are attended with lymphatic enlargements.

The treatment advised for impetigo is generally successful in the management of porrigo and ecthyma. External applications are rarely sufficient to subdue the affections as effectually as when the iodides and vegetable alteratives are internally administered.

Strophulus, lichen, and *prurigo,* are papular forms of skin disease, and distinguished from eczematous and impetiginous vesicles by the development of papules. The eruption may appear upon any part of the body, but generally manifests itself upon the face and arms. Prurigo is peculiar to old age, and is probably due to want of cleanliness. Lichen attacks women oftener than men, and shows itself periodically, or during extremes of heat and cold.

The treatment of papular forms of skin affections is comprised in local and constitutional measures. Tar ointment has been praised as an external agent, and so has a cerate containing carbolic acid. Borax in solution has received encomiums from the afflicted. Alkaline baths are serviceable. Alteratives, salines, and iodides, have been administered internally with beneficial results. A dose of chloral hydrate, in camphor water, may be given at night to allay the irritation and secure rest. The opiates sometimes aggravate the disease.

Pityriasis and *psoriasis* are squamous or scaly varieties of skin disease that are allied to eczema and herpes, though not characterized by vesicles, pustules, or papules. Red patches form on the skin and shed an abundance of furfuraceous scales. The affection oftenest attacks the scalp, and the skin near the bends of the joints. Probably pityriasis and psoriasis are varieties of eczema, though dermatologists persist in a separate classification for them. Strumous subjects are most liable to these affections; chrysophonic acid mixed with simple cerate or lard, two drachms to the ounce, is the best curative agency.

The treatment consists in the administration of the salines, iodides, and vegetable alteratives; and in the topical use of juniper tar soap, glycerine and Fowler's solution, an ounce of the former to a drachm of the latter, emulsions of bitter almonds, camphor ice, "cold cream," and an unguent of chrysophanic acid. A solution of borax has answered an excellent purpose. Elder ointment has been extolled, as well as other reputable cerates in common use. Citrine ointment reduced by the introduction of two or three times as much lard, and scented with an agreeable perfume, should not be neglected in obstinate cases. Psoriasis once subdued is liable to recur again when the cold season returns. Visits to the White Sulphur Springs of Virginia, and the Hot Springs of Arkansas, have eradicated obstinate forms of squamous skin diseases.

Maculæ, liver spots, and pigmentary changes in the skin, are frequent and disfiguring. From some cause not always known, an excess of pigment lodges in the deeper layers of the epidermis, and produces maculæ, or liver colored spots, of greater or less dimensions. The forehead is a favorite location for the discoloration to appear in pregnant women, and those who suffer from uterine disease. Men sometimes have large maculæ upon the arms and abdomen; and as a general thing, the stains depend upon a slight syphilitic taint. Disease of the supra-renal capsules (Addison's disease), is attended with a bronzed appearance of the skin, but this discoloration is general, and not confined to spots, like the maculæ under consideration. The prolonged use of nitrate of silver internally, will sometimes produce discoloration of the skin, similar to that which exhibits itself in Addison's disease, though the nitrate of silver is not known to derange the supra-renal capsules.

There is no remedy which will thoroughly eradicate maculæ, though a solution of borax topically applied every day will soon lessen the discoloration, and finally reduce it to a shade scarcely observable. If iodoform be given one day, and sulphur the next, for a few weeks or months, while the solution of borax is topically applied, the maculæ will at length be thoroughly eradicated. The use of podophyllin, calomel, and other reputed liver medicines, produce very little impression upon "liver-stains." It is a mistaken notion that a person having maculæ is bilious, or suffering from inactivity of the liver. Occasionally an individual is met who has lost the cutaneous pigment in spots. The colorless patches are usually upon the hands, though other parts of the body may exhibit this pie-bald appearance. In some instances there is a furfuraceous desquamation, as if the disease were allied to eczema. The external use of corrosive sublimate dissolved in alcohol, four grains of the salt to an ounce of liquid, is the very best agent to remove maculæ. Rub the stained parts daily.

Scabies, an animal parasite, called by dermatologists *sarcoptes hominis,* burrows in the epidermis and forms a nidus in the deeper layers. The presence of the parasite produces an intolerable itching, consequently the vulgar have named the disease "the itch." The microscopical animal creates irritation enough to develop a vesicle, and several inhabiting one neighborhood, a patch of vesicles is established between the fingers, and in places where the parasites plant themselves. Scratching may convert the vesicles into papules and pustules, so that scabs and crusts of considerable magnitude may cover a nest of minute parasites.

Scabies is a disease which affects children, especially those who are neglected, or not often washed with a good class of soaps. The affection is contagious, the parasites becoming transferred from one person to another by shaking hands, or by children joining hands while at play. The use of the same towel by several individuals is a common way for the disease to be communicated.

The treatment of scabies consists in cleanliness, and the application of sulphur. Other agents may destroy the parasite, yet few are so reliable as sulphur. The agent is commonly used with lard or cerate. The sulphur ointment of the pharmacopœia is as good as any, though it should be scented with bergamot, or other agreeable perfume. It is well to wash a child thoroughly and completely with soap and water, then finish the ablution with an alkaline bath—carbonate of soda being dissolved in water for that purpose. Then the perfumed sulphur ointment is to be used between the fingers and toes, and upon the wrists and affected parts of the body. Too much sulphur should not be employed, lest harm result from the absorption of large quantities. Muscular pains and stiffness of the joints, with more or less headache and coryza, are the usual effects of too much sulphur. Scabies has been overcome by the topical application of a weak solution of carbolic acid. An ointment composed of an ounce of lard and twenty grains of iodide of ammonium will cure the disease in some instances. The mercurial unguents are parasiticides, and so are some of the vegetable cerates. The products of coal oil, as kerosene, benzine, and paraffine, will quickly subdue scabies. Pure rock oil has become quite popular as a remedy for itch in West Virginia, and districts where petroleum is produced.

Malis Pediculi.—The human body may be infested with several varieties of lice. The head-louse is common among children who run at large and rarely have their hair cleansed or dressed; no other treatment is needed but the free use of a fine ivory comb.

The body-louse is the pest of soldiers, sailors, lumber-men, and such persons as can not enjoy soaps, baths, and a frequent change of clothing. The filthy and ragged are frequently lousy. The parasite does not infest the head, but abides in the seams and folds of shirts and drawers, and makes frequent incursions upon the body. They crawl rapidly, and the itching and creeping sensations produced are very annoying. Sometimes, when exceedingly numerous, body-lice partially burrow in the skin, and show little disposition to range about.

Antiparasitic remedies will not rid a person of body-lice unless the clothing can be frequently changed. The throwing aside of woolen garments, and the adoption of cotton and linen apparel, will greatly assist in a speedy deliverance from the pests. An infusion of tobacco applied to the skin in quantities not to produce dangerous nicotism, is a popular antiparasite. Free inunctions with fish oil are employed by sailors to free themselves from lice. Crude petroleum will destroy all kinds of parasites.

The "crab-louse"—*pediculis pubis*—is a parasite which inhabits the genital hair, and fastens upon the skin of the pudendal and perineal regions. It is common among those people who sleep in the unchanged sheets of cheap hotels and untidy steamboats. Those individuals who indulge in promiscuous sexual intercourse are quite liable to become infested; and the parasite may, by some accident, get upon the bodies of the chaste. The presence of crab-lice is not to be regarded as proof of sexual irregularity. The crab-louse may find its way to the arm-pits, whiskers, and eye-brows, and there flourish as if in favorite regions.

The destruction of crab-lice is accomplished by the use of the white precipitate ointment, or, in fact, by the topical employment of any of the mercurial unguents. Sperm oil proves their bane; so does petroleum. Eau de cologne is reported as a destroyer of crab-lice, but I have not found it effectual. Infusions of tobacco and staphysagria are reputed good parasiticides. However treated, the remedy must be employed at intervals for months, as a nit deposited on an isolated hair at a distance from the pubic region, may be slow in hatching, and the young louse escape the action of a remedy which is employed only for a few days.

SECTION III.

TUMORS.

A TUMOR may be defined as an unnatural enlargement or morbid growth, not included in the original structure of the body. It often differs from the texture from which it springs, though not always. An exostosis is an outgrowth of osseous material which is not essentially at variance with the bony matrix from which it is produced. Adipose tumors are much like the fatty masses in which they have their origin; and tumefied glands, or simple hypertrophies, do not deviate in structure from the normal tissue of which they form a part.

Tumors have an inherent power and method of growth, yet depend upon surrounding parts for vascular supplies. They continue to grow without conforming to any particular law of development, as healthy structures do. When the body is grown, it only maintains its normal type; but a tumor continues to increase, though at the expense of the remainder of the organism. The body wastes so much during the development of ovarian tumors and uterine fibroids, that the adventitious material is sometimes equal in weight to the rest of the organization.

The cause of tumors is exceedingly obscure. It is easier to understand how an abnormal growth is nourished and developed than to comprehend its origin. A perverted or morbid cell begets other cells of like character, and the reproduction becomes more active than in healthy cells. The normal forces engaged in growth and nutrition, in accordance with the usual standard, are not suppressed in the abnormal product, but are perverted in function, so that they contribute to the departure from the original type. But how the first morbid cell became deranged in function, is a difficult problem to solve.

The time may come when histological investigations are so far advanced that the nature and cause of tumors will be better understood than at present. It would be certainly more satisfactory to understand the physiological forces which develop tumors, than to be compelled to classify them according to their anatomical structures. But as the vital processes in a morbid growth are not essentially different from those manifested in ordinary healthy structures, the principles which govern the evolution of tumors will be shrouded in mysteries as long as vitality continues undefined.

An enlargement of certain glands, as the thyroid, prostate, and tonsils, is to be considered in the light of an hypertrophy, no altered material entering the excessive development; therefore such overgrown bodies can not be strictly called tumors. Enlarged lymphatic glands are not substantially tumors, though they sometimes lose their glandular character, and become independent sources of adenomatous evolution.

Tumors may be divided into two great classes, the distinctive features being those which refer to their character as malignant or benign. The latter are then subdivided into the encysted and the solid; and these again into several varieties, the characteristic depending upon the contents of the cyst, or the constituents of the solid mass. Besides, there are numerous variations that do not strictly conform to either of the classifications, yet are embraced in the nomenclature of tumors. A polypus is neither a cystic nor a solid tumor, but a peculiar outgrowth of the structure from which it springs.

There are several classes of cystic tumors, as the serous, the synovial, and the mucous; then there is the complex cystic and the proliferous. Solid tumors have been divided into the fatty (adipose and lipomatous), the fibrous (the latter including in its combinations the areolar, the muscular, and the neuromatous): and then there are vascular, cartilaginous, and osseous tumors. Other characteristics might be named, as constituting divisions, but the extension of varieties seldom aids in the elucidation of a topic which is already diffuse.

A cystic tumor consists of a sac or bag, which contains fluid or granular matter that has been secreted by the inner layer of the cyst-wall. Its origin may be due to the extravagant growth of elementary structures in the form of cells, which, through some inappreciable perversion of function, become sacculi with textural walls, capable of producing tumor-material. The nature of a cyst, which is known by its contents, depends much upon the region of the body it occupies. Cystic tumors of the scalp are generally steatomatous, their cavity being filled with curdy or granular matter, with crystals of cholesterine. Those about the orbits contain oily substances; those of the neck a jelly-like mass; and those of the ovaries an acrid fluid peculiar to enlarged Graafian vesicles.

Serous tumors are exceedingly common, and contain a thin liquid which in consistence does not vary much from the serum of the blood, though in color it may differ essentially. Serous cysts also have honey-like contents, and then they are called melicerous; or they may enclose a fluid which has the appearance of jelly, and take the name of colloid tumors. Hydroceles contain hygromatous fluids, and have their seats near the glands. The thyroid body develops cysts which are described as hydroceles of the neck.

The walls of serous cysts are membranous in appearance, and moderately vascular; their outside is usually joined with considerable firmness to the surrounding connective tissue, and their inside is lined with tesselated epithelium, or a nucleated membrane. Serous cysts may exist as single and isolated bodies, or in clusters. Hundreds may be developed in one place, and appear like the clustered and developing eggs in the ovary of a hen. One cyst often takes the lead of the rest, and when removed another will press forward as if to make the place good, as do the unlaid ova of a bird.

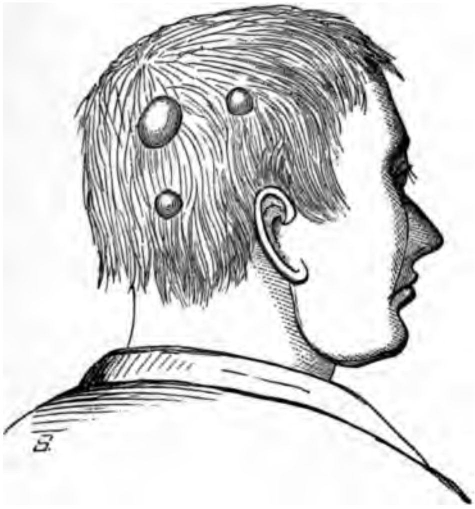
The diagnosis of serous cysts which are near the skin is usually not difficult. The tumors are smooth, round, and well-defined; they are painless and covered with healthy integument. When not tensely filled, fluctuation can be felt in them; but if firmly distended, they will scarcely admit indentation. In some instances a cystic can not be distinguished from a solid tumor until excised. When it is important to make the distinction, an exploring needle may be employed. Chronic abscesses with circumscribed walls sometimes appear like cysts.

Among the simplest of surgical diseases are cystic tumors, which generally appear upon the head, neck, and shoulders, but in the scalp a hundred times more frequently than upon all other parts of the body. In common language they are denominated *wens;* and in the older surgical nomenclature they received names derived from the appearance of the contents of the cysts—as *melicerous*, *atheromatous*, and *steatomatous*.

The contents of a melicerous tumor bear a certain resemblance to honey; an atheromatous cyst contains material of the consistence of pap; and the sac of a steatomatous tumor encloses a quantity of fatty granules.

Encysted tumors of cutaneous origin sometimes embrace hair and oil, therefore they might be called *pilous* and *oleaginous* tumors. The hairs are not long, as if springing from the scalp, but appear like those ordinarily growing from the skin. It is not demonstrated how hairs get inside of these tumors: the supposition has been that the cysts begin in an obstructed sebaceous gland; and that in the development of the tumor a hair follicle gets involved, one hair after another growing inside the sac. An objection to this theory is that the hairs have no bulbs.

FIG. 28.



Cystic tumors of the scalp.

The ordinary material found in cysts of the scalp is white and glistening, and of the consistence of curd or cheese. Epidermal scales and granules of cholesterine, with liquid and laminar matter, usually make up the cyst-contents.

Encysted tumors of the scalp are generally not observed until they attain the size of peas; and they develop so slowly that they may be years in reaching the magnitude of marbles. There is no pain nor inconvenience attending their evolution, no inflammatory action being appreciable in the developing process.

The sac is usually spherical or oblong, and quite thin and friable. It is small in comparison with the size of the tumor—the scalp by its great thickness contributing largely to the dimensions of the lump.

When cystic tumors of the scalp have reached a degree of maturity, or have become as large as filberts, the hair falls from their summits, and leaves them bald and exposed to view. Sometimes a dark spot is discovered on their surfaces, and a minute canal leading to the inside of the cyst walls.

There is a tendency in some families to the re-appearance of cutaneous cysts, generation after generation. I am personally acquainted with an old man who has three cystic tumors of the scalp; a son has one on the arm, and a daughter two on the neck; and a grandson has a small tumor of the same variety beneath the integument of the ear.

There are several modes of procedure in eradicating cutaneous cysts, but the best way is to excise or enucleate them. A practitioner of my acquaintance has destroyed two cysts of the scalp in a member of his family by injecting the tincture of iodine into the sacs, using a hypodermic syringe for the purpose of introducing the fluid. A sudden and heavy blow of an accidental nature burst the sac in an instance coming to my knowledge, and the subsequent inflammation wrought a radical cure. In one case where the cyst was evacuated through a narrow incision, the sac refilled, as might be expected.

Excision or enucleation is performed as follows: When the tumor is no larger than a medium sized marble, an incision may be made in the scalp covering the cyst, and then the sac can be seized with toothed forceps, and carefully dragged from its bed and surroundings. However, the teeth of the forceps are liable to tear the delicate sac, when some portion of its contents spurts out. In fact, not one sac in ten can be removed by evulsion without tearing and emptying it. The best way, therefore, is to cut through the scalp covering the cyst and the sac at the same time; then the cyst-walls may be seized with toothed forceps, and gently enucleated. If a piece tear out of the sac, the remaining portion may be grasped and pealed from its attachments. Should the operator not be certain that every part of the sac was removed, he might prevent a return of the disease by cauterizing the cavity with a strong solution of carbolic acid. This would excite inflammation, and destroy the secretory power of any portion of cyst-wall that might be left behind.

The after-treatment consists in adjusting the edges of the scalp-wound, and sponging from day to day the parts to keep them clean. No sutures, plasters, nor compresses are needed. The wound may be wetted occasionally with arnica, aconite, or camphor, yet no such application is necessary. It is well to keep the hair from becoming entangled in the healing wound.

Erysipelas is spoken of as a disease likely to attack wounds of the scalp, yet my experience will not sustain the idea. However, it may be prudent to wash scalp wounds daily with a weak solution of carbolic acid, to avoid erysipelatous complications.

If a cystic tumor of the scalp be as large as a pullet's egg, and I have treated such, it is a good plan to make two semicircular incisions on the sides of the tumor, so that in the removal of the cyst, an elliptical piece of integument shall be taken with it. The edges of the wound will then come together without there being a superabundance of covering for the wound beneath.

Tumors which have become closely adherent to adjacent tissues by pressure of the hat or through injuries and subsequent inflammation, can not be enucleated, and therefore have to be dissected out as though they were fibrous structures.

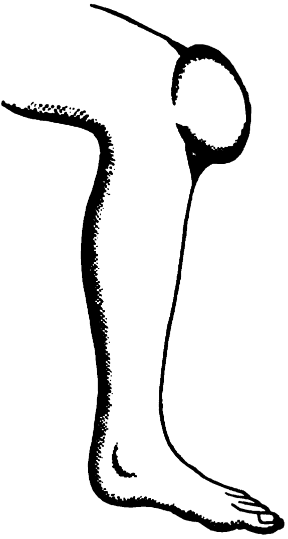
Enlarged synovial sacs near joints, tendons, and where motion calls for synovial bags to obviate pressure and friction, are called diseased bursæ mucosæ. Subcutaneous bursæ are numerous, and chiefly occur between the skin and some bony prominence. Adventitious bursæ are formed below corns, and in bunions; and may be developed beneath the accidental callosities which attend talipes. A bursa in front of the patella, and the tubercle of the tibia, gets enlarged from pressure attending kneeling; and as the woman who scrubs floors does so upon her knees, the disease is most common in her, hence it is called "house-maid's knee."

Irritation calls a fluid, the character of serum, into these sacs or cysts, and friction converts it into a liquid which acquires more and more the nature of synovia. In synovial pouches about the knee, condensed masses of fibrinous material assume the form of melon seeds or date stones; they dart around the arthrodial surfaces, and are called false cartilages. The popping character of one of these bodies when an attempt is made to catch or arrest the object, has given it the vulgar name of "joint-mouse."

Enlarged synovial sacs may inflame, burst, and suppurate, producing a great amount of trouble first and last. Those of the great toe (bunions) are, from their location, the most annoying, the wearing of a shoe serving to keep up irritation. "Floating cartilages" in bursæ of the knee are the most dangerous.

The largest bursæ are those which form between the patella and the skin, and are produced as already stated, by prolonged pressure upon the knees. In women the disease comes from scrubbing floors while in a kneeling posture; and in men who are engaged in laying bricks, setting grates, and performing other kinds of work while resting upon the knees. A blow upon the patella has frequently been followed by an enlarged bursa. The tumor is so extensive that the patient is unnecessarily alarmed, and is afraid the joint may be affected. Although the growth of the sac may reach the borders of the articulation, the cavity of the joint is not penetrated.

FIG. 29.



House-maid's knee.

The contents of an enlarged patellar bursa are usually clear and limpid as water, though in time the fluid may become thick as jelly. From the bursting of minute vessels stains of blood have been observed in the evacuated liquid. If the fluid be chocolate-colored, blood has been extravasated sometime, and decomposition of it has taken place.

Fringe-like shreds grow from the inner walls of bursæ, and occasionally become detached, then they coil into knots or consolidate into hard bodies which maintain a free and independent existence in the bursal sac.

The puncture of a synovial bag situated on the patella is a simple operation, a trocar and canula being used to evacuate the fluid. If the sac refill, the tincture of iodine may be injected through the canula after the contents of the tumor have been drawn off. After a cure has been established a cushion of felting, or other soft and compressible substance, should be worn upon the knee when work in the kneeling attitude is required.

Loose oval bodies, called false or floating cartilages, in the synovial cavity of the knee-joint, often get between the articular surfaces, and produce a lock as a nail in a hinge. When such is the case the pain is sudden and intense, the patient falling as if shot.

A peculiarity of loose cartilages in the joint is that they can be easily found on one side of the articulation or the other, when not sought; but when hunted they seemingly retire to some pocket in the joint and evade discovery in the most provoking manner. A patient once came to me from the country to have a false cartilage removed from the knee-joint. Upon arrival he said he could find and fasten it with his fingers whenever he pleased. An hour was set for the operation, but at that time the loose body defied discovery; and a whole day was spent by the patient in walking and working the joint before the "joint-mouse," as he called it, left its hiding place. I then seized the body with long toothed forceps, the teeth transfixing the integument and enveloping tissues before fastening upon the slippery truant; then a valvular incision was made an inch above, which divided all the structures and opened the sac, and a slender pair of toothed forceps were sent through the incision and made to grasp the body. The teeth of the long toothed forceps now were made to relax their grip, and the other forceps removed the false cartilage from the wound, a finger making pressure behind the loose body while it was escaping to prevent the entrance of air and blood to the articular cavity. A compress was then bound upon the valvular incision, and the limb kept at rest for several days. The patient took chloral hydrate all the time to avoid tetanic complications. A medical gentleman of my acquaintance in the West Indies, cut for and extracted a false cartilage, and then sent his patient home in the rain. That night the individual experienced a rigor, and the next day he had tetanus, of which he died in a few days.

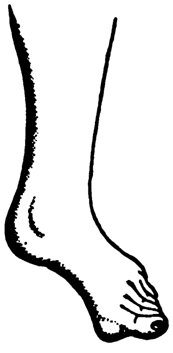
A bursa over the tubercle of the tibia is somewhat rare. It is produced by pressure, irritation, and injuries; and is to be managed much the same as a patellar bursa. Evacuation of the fluid, and injection of the sac with the tincture of iodine will generally be followed by a radical cure, whilst puncture, compression, and free incision have occasionally failed. The tincture of iodine painted upon the integument covering the bursa is reported as having caused absorption in a few instances.

As already stated, the bursa of bunion is exceedingly troublesome. Some families are liable to a distorted condition of the great toe, the first phalanx forming an obtuse angle with the metatarsal bone. In bad cases a semiluxation takes place, and there is some outgrowth of bone, like an exostosis. Upon the prominence formed at the metatarso-phalangeal articulation a bursa is developed between the skin and the internal lateral ligament. The shoe necessarily presses upon the joint, whether ill-fitting or not, and produces pain, swelling, and a degree of inflammation which may result in suppuration. If the inflamed sac would get well after suppurating, as an abscess does, there might be some encouragement for patiently enduring temporary pangs, but sinuses about the joint often occur, and necrosis is no uncommon sequence. Should the inflamed and suppurating sac be laid open, the operation is not always followed by reparative action, but a period of suffering more or less prolonged has to be endured.

After the bursa of a bunion has been opened, the cavity of the sac should be smeared with the tincture of iodine; a compress may be placed between the great toe and the next, to prevent strain upon the internal lateral ligament by a tendency of the toe to twist outwardly; and a wide shoe worn, a compress of felting being placed against the metatarsal bone so as to take all pressure from the bunion.

In rare cases there is no treatment so successful as amputation of the toe and a piece of the metatarsal bone. The operation seems rather serious for the cure of anything so insignificant as a bunion appears to the unprofessional, yet surgical experience has taught that this is occasionally the preferable course.

FIG. 30.

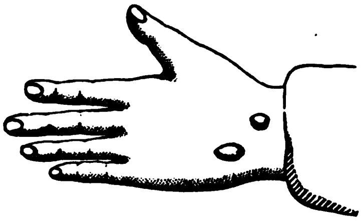


Bunion.

The point of the elbow, when bruised or pressed upon, as is the case with miners, will enlarge and become transformed into a bursal tumor. I have met with two or three cases in individuals who did not rest upon the elbows, nor offer other provocation for the development of the disease. In one instance both arms were affected, bursæ having formed between the olecranon processes and the skin. Puncture, evacuation, and injection with tincture of iodine, proved a permanent cure.

Tumors on the back of the wrist are frequently enlarged bursal pouches pushing out from beneath the annular ligament. They rarely communicate with the articular synovial sacs which are numerous in the carpus, but spring from the sheaths of the superficial or deep tendons. Ganglion and "weeping sinew" are terms which have been employed to designate bursal tumors of the wrist and hand. The palmar aspect of the hand sometimes is affected with enlarged sacs, the tumors extending along the course of the digits. The lumps are generally elastic, and the fluid can be squeezed from one portion of the tumor to the other. In time the gelatinous fluid may become transformed into a condensed mass nearly as hard as cartilage. In such cases the finger is held permanently flexed.

FIG. 31.



"Weeping sinews."

Enlarged bursæ of the synovial sheaths of the wrist and hand rarely are attended with much pain, but a sense of weakness and embarrassment is complained of. When fibrinous bodies the size of millet seed exist in bursal sacs, a creaking sensation can be produced by bending the fingers or pressing upon the tumors.

The treatment of an enlarged bursal sac in the wrist or hand consists in puncturing the tumor with a slender knife or tenotome. The narrow incision evacuates a glairy fluid of the consistence of jelly. But the internal surface of the bursa re-secretes the fluid and re-distends the sac. To prevent this tendency to return, a hard substance, as the half of a bullet, may be sewed between two pieces of buckskin, and tied firmly upon the evacuated and collapsed sac. The pressure begets irritation or inflammation enough to obliterate the sac or to destroy its secreting power. Instead of pressure, which sometimes fails, a hypodermic syringe may be employed to inject the emptied sac with tincture of iodine. The use of a seton has resulted fatally in several instances. Even a puncture of the sac has been followed by unpleasant symptoms. A popular cure is to strike the tumor a sudden and heavy blow. This force is expected to burst the sac, and dissipate its contents in the adjacent loose structures. But if suppuration follow, as it will occasionally, the danger is not trifling. In one instance where a school-boy burst a ganglion on the back of the hand of a companion with a heavy ferrule, the inflammation ran so high that I was obliged to poultice the part injured, and afterwards to make incisions to set free the diffused pus. Easy movements of the tendons were permanently impeded by inflammatory deposits.

Bursal tumors may form in so many places that it is not easy to enumerate and describe them. I met with one case in which the bursa of the cartilaginous pulley in the orbit where the tendon of the superior oblique muscle passes, became enlarged. I did not discover its nature until, in an attempt at removal, the sac burst, and the contents revealed its character. The operation resulted in a cure. Bursal developments may occur beneath the skin at the symphysis and at the angle of the jaw. The synovial sheath covering the central tendon of the digastric muscle may enlarge and form a prominent tumor in the neck. A bursal enlargement may appear upon the prominence of the pomum Adami, the synovial sac being connected with the thyro-hyoid ligament. Bursal tumors may be developed at both extremities of the clavicles, and upon the acromion process of the scapula. Synovial pouches about the shoulder-joint, in the axillary region, may, from being in proximity with a large artery, have a pulsating thrill imparted to them, which may excite the suspicion that an aneurism exists. The sheath of the long head of the biceps may become distended into an appreciable tumor. The bursa between the tubercle of the radius and the biceps tendon may be tumefied from accumulations of synovial fluid and adipose material. I have several times met with an enlarged bursa between the tendon of the latissimus dorsi and the inferior angle of the scapula. A bursal tumor between the glutæus maximus and tuber ischii, and another between the glutæus medius and the apex of the greater trochanter, are possible. In fact, bursal tumors in the vicinity of the hip are numerous, and some of them may be mistaken for hernia, aneurism, or abscess. An enlarged ischio-gluteal bursa becomes irritated through the frequent pressure of sitting, and may inflame and suppurate. The abscess in such a case is slow in working its way to the surface; and the sinus which succeeds is a troublesome affair to make heal. In some instances, caries is suspected from the prolonged suppurative condition.

An expanded bursal sac of considerable magnitude is occasionally found beneath the quadriceps tendon just above the knee. This is a formidable affair, and should not be incised, but treated with injections of iodine.

A distended bursa beneath the popliteus muscle, and communicating with the joint, is so near the popliteal artery that pulsation is communicated to it, hence aneurism of the vessel is suspected. Several muscles near the knee have bursæ which through enlargement may constitute serous tumors. The tendon of the biceps flexor cruris has a bursa where it passes over the head of the fibula, and a distended state of the sac is not uncommon. The bursa between the tendo-Achillis and the os calcis may undergo changes in the way of distension which render locomotion painful. I have recently had one under treatment which suppurated, and discharged two inches above the seat of disease, through openings on each side of the great tendon. The sinuses obstinately resisted means employed to establish the healing process. I injected the cavities with carbolic acid every day for several weeks, and at length hastened the cure with injections of the fluid extract of pinus canadensis.

The ankle-joint has many bursæ in its vicinity, but these synovial sacs rarely become enlarged. The tarsus occasionally exhibits a distended bursal pouch, but the sheaths of tendons passing over the foot oftener exhibit synovial tumefaction.

Mucous cysts, generally the result of obstructed ducts, constitute a variety of cystic tumors. They appear so much like serous cysts, that location alone is to be depended upon as a distinguishing feature. Sebaceous tumors of the scalp have been classed as such, though I have not thus arranged them. The hair follicles have excretory ducts which discharge oily matter; and the acclusion of one of these might lead to the development of a cystic tumor, but I can not see why it should be called a mucous cyst. Ranula, which comes from obstruction of the Whartonian ducts, is a true mucous cyst, for the lining of the canal is an extension of the mucous membrane of the mouth. Occlusion of the duct of Steno constitutes another of the same class of tumors; so do obstruction and enlargement of the labial, buccal, lingual, and pharyngeal ducts. Cysts of the antrum, and of the *ductus ad nasum*, are in the same class. Dilatation of the lacteal and seminiferous ducts constitutes a set of tumors of the same general character. Tumors of the vulva are often caused by the obstruction of the mucous canals leading from the glands of Duverney. Cysts of the ovary are subject to the same classification; but as these diseases are to be described with the surgery of the parts to which they severally belong, further notice of them will be omitted in this place. It may be stated that the common treatment for mucous cysts is to lay them open, and employ measures to favor granulation in their cavities; but special methods of management must be applied to particular forms of disease.

Proliferous cysts are complex in their organization, a peculiarity which distinguishes them from the simple barren cysts just described. Hydatid cysts of the peritoneal cavity, and multilocular tumors of the ovary, are typical forms of the disease. They have the power of multiplying themselves by the generation of new cysts upon their inner or outer walls. If a multilocular cyst of the ovary has several compartments in its original construction, and does not increase the number of its sacs during its development, the tumor is not of the cystigerous variety. It is merely compound, and not proliferous—the latter term signifying capacity for reproduction. A compound cyst may be "barren" as well as a single cyst. I once had a female patient who was presumed to be laboring under ascites. I performed paracentesis abdominis twenty times in the course of two years, and drew off several gallons of serous fluid at each tapping. At last the woman died rather suddenly when the abdomen was not immensely distended. An opportunity for holding an autopsy having presented itself, I gladly embraced it. Upon opening the abdomen I found one large cyst which had been evacuated so many times, and a countless number of small cysts which studded the peritoneal surface. A few of these were three or four inches in diameter, and many were the size of grapes; but the greatest number were that of mustard seed. The disease was emphatically proliferous, and of the hydatid variety. The larger cysts contained a ropy fluid, and many endogenous or intra-parietal growths, and a few which developed from the outside walls.

Sero-cystic sarcomata are frequently of a proliferous nature, and are chiefly found in or near the thyroid and mammary glands. These cysts are either recurrent, or the neoplasms are so minute and infinite that they escape excision, and come forward as soon as the larger forms are excised. This disposition to reproduce their kind, and the resistance they offer to attempts at destruction, have led to the opinion that cysto-sarcoma is malignant; but they do not contaminate the blood, and bring about that state of devitalization so peculiar to cancer.

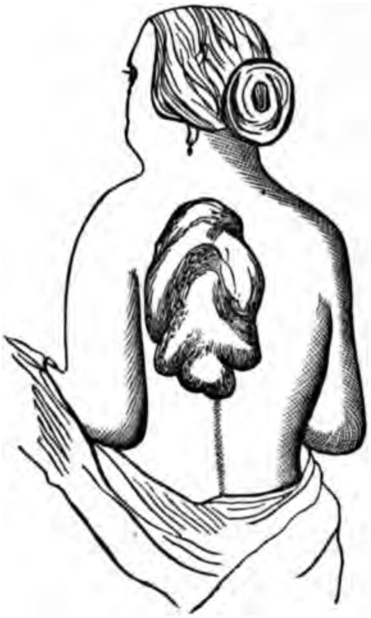
Of solid tumors the fatty or adipose (lipomata) are far the most common. They may appear in the subcutaneous tissue of any part of the body. I have recently excised one from the neck, another from the back, a huge one from the nates, and large ones from the thigh. They are the most innocent of tumors, being constituted chiefly of lobes of fat. They are easily excised, and there is no tendency to a return of the disease if all the lobes be removed.

The anatomical formation of adipose tumors is exceedingly simple. They are masses of fat, which take a lobulated form through the agency of connective tissue. The firmness of the tumor depends in a considerable measure upon the density of the enveloping material. A fatty tumor developing where the tissues are loose, will generally exhibit a flabby appearance; while the same kind of a tumor found among closely interwoven structures may be so dense and firm as to raise the suspicion that the morbid development is fibrous in its nature.

I have removed fatty tumors from the deeper parts of the neck which seemed to have derived their great density from the pressure of surrounding structures; and met with tumors of the same character in the loose subcutaneous tissue beneath the armpit which were so soft and yielding that their outline could not readily be defined. The accumulations of fat in and about the mammary glands are sometimes too excessive to be free from the imputation of being morbid, though they give no further trouble than that of dragging sensations which come from weight alone. It is not judicious to excise such masses; and no system of medication seems to lessen the bulk.

The dorsal region of the body is often the seat of fatty tumors which present a pendulous and lobulated appearance. When left to themselves for years they have been known to attain a monstrous size, so that it is a burden for the possessor to carry them. They have a fibro-cellular capsule which constitutes partitions to the lobes, and attaches the entire morbid mass to the firmer structures beneath. The arteries which nourish the tumor are small twigs that ramify in the capsule, and send minute branches to the lobes. The skin becomes adhered to the tumor and helps give it support; and when not thus sustained, the morbid mass when quite heavy, slides downwards an inch or two. Lipomatous tumors form on the trunk, and on the arms and thighs, and rarely appear on the forearm or leg. Occasionally they are attended with slight pain, and some inconvenience from chafing of the clothing. They grow rather slowly, several years being consumed before one the size of an orange is attained. They continue of the same general character from beginning to end and undergo no particular changes, except that of increase in growth. When severely injured they may inflame, suppurate, and even slough; and afterwards undergo induration or degeneration.

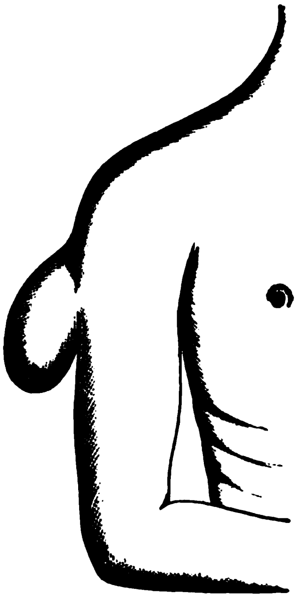
FIG. 32.



Lipomatous tumor of the back.

Fatty tumors in the inguinal and femoral canals may resemble hernial protrusions, and lead to serious mistakes in treatment. A woman once consulted me in regard to what she had been told was a hernia. She wore a truss which had been applied by professional hands; yet complained that the instrument would not retain the protruded mass. I found that a fatty tumor the size of a hen's egg occupied the region below Poupart's ligament where femoral hernia usually emerges. Of course the truss was useless, and as no inconvenience arose from the presence of the tumor, I threw the truss aside, and allowed the innocent mass to remain undisturbed.

Fig. 33.



Adipose tumor of the arm.

Excision is the only treatment for such fatty tumors as ought to be removed on account of their being unsightly, inconvenient in bulk, or a hindrance to the ordinary movements of the body. The operation is rarely intricate or dangerous. An incision through the skin and fascia which cover the tumor, will allow the finger to be introduced deep into the wound, when the morbid mass may be forced from its attachments and turned out of its place. Bands of fascia which are too strong to be readily lacerated, may be divided with scissors. No considerable hemorrhage will attend the evulsion. If the integument is adhered to the tumor at its most prominent aspect, a double incision in the form of an ellipsis may be made to embrace whatever of adherent skin should come away with the fatty growth. All the tegumentary covering of pendulous tumors should be removed with the morbid mass, except enough skin near the base to form flaps for the purpose of closing the wound; and it must be borne in mind that considerable integument is required to cover the space occupied by a large tumor. I never regretted leaving too much integument; and have often been sorry that I did not leave more. In some parts of the body the skin is more abundant than in others, consequently an estimate must be made of the amount of flap-material which may be available. A tumor the size of an orange on the arm or thigh demands little integument to cover the wound; but one the size of a cocoa-nut usually requires, to close the chasm, about all the skin which can be saved during the operative process. I once removed a fatty tumor from the outer aspect of the thigh which was larger at its base than a well developed mammary gland; and so much of the superimposed integument was closely adherent to the morbid mass, that I could not well preserve enough skin to close the wound. I have a dense fatty tumor in my collection which is seven inches in diameter; it is nearly round, and was excised from the nates; its attachment was by a pedicle not thicker than the wrist. The patient was a woman, and she endured the inconvenience of the tumor for twenty years through aversion to having the defect known and treated.

Fibrous tumors are as common as fatty growths of a morbid character, and generally more difficult to remove. In structure they are usually dense, being made up of compact layers of fibrous tissue; and they often closely adhere to adjacent structures, or develop in organs, as the uterus, where they resemble hypertrophies. In the several situations where developed, fibrous tumors tend to the spherical or oval shape, but conform to the space given to them by the resistance of surrounding parts. They are invested with a thin capsule, though this is sometimes lost through pressure and blending influences. Fibrous tumors growing from bones are periosteal in origin; those developing on nerves, are undoubtedly neuromatous; and such as appear in intimate relation with muscles and tendons, partake of the nature of the substance from which they spring. Osseous and cartilaginous tumors have more or less fibrous tissue in their construction.

The section of a fibrous tumor exhibits a firm net-work of tissue. Bundles of fibre are closely packed, though there may be interspaces filled with plastic matter of a grayish, yellowish, or dull white color. In spots the bundles of fibre seem to be twisted into concentric masses, like the contorted structure of gnarled wood.

Fibrous tumors may be purely such, so far as ordinary observation is concerned, or they may present a mixed nature, as fibro-cellular, fibro-cystic, and fibro-plastic tumors, found in restricted regions of the body. The genital organs are frequently the seat of fibro-cellular outgrowths, which sometimes are marked by rapidity or magnitude of development. Fibro-cystic tumors have their origin near the joints; and fibro-plastic masses of a morbid character, may be found in glands which have undergone chronic inflammation.

Fibrous tumors are slow of growth, generally painless, firmly planted in surrounding structures, and are liable to be mistaken for scirrhus, osteomata, enchondromata, and hard tumors of a cystic nature. I once removed a tumor the size of a hen's egg from the lower jaw, and had no idea there was any malignancy about it until after removal. A section of the morbid mass disclosed its cancerous character. When no harm results from a mistaken diagnosis of this kind, the patient has no just grounds for complaint. If I had known the tumor was a malignant growth, I should have advocated its removal by the same operation as was performed. If the tumor had proved to be an aneurism, the operation would have been censurable.

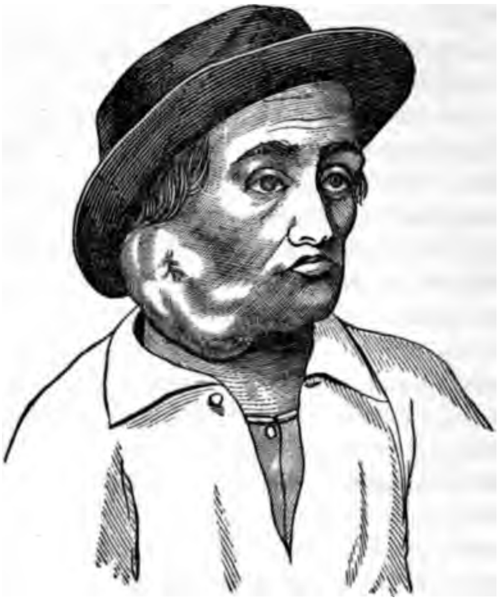
Parotid Tumors.—Morbid developments in the parotid region are common, and, though serious in their nature, are not necessarily fatal in their tendencies. They may originate in some of the lpmphatic glands in the vicinity of the parotid gland, and, after undergoing a variety of evolutions, eventuate in tumors of one kind or another. Those of a cystic character are innocuous, and may be removed with little trouble or danger. To be sure, the region is traversed by important arteries, veins, and nerves, yet superficial tumors may be removed without disturbing the deeper structures.

To remove a cystic tumor of the parotid region, an incision is made down to the walls of the cyst, and even into it, for the sac is generally so thin that it will burst in attempts at removal. Besides, a collapsed cyst requires a small opening for its delivery; its walls are seized with toothed forceps, and dragged from their recesses; the cyst is enucleated.

A fibrous tumor, say the size of a hen's egg, needs more care in the evulsion; a larger opening is demanded for its delivery; and its attachments are more tenacious. After the primary incision is made through the integument and the platysma myoides fascia, the tumor is generally seen, and the forefinger is then used to isolate it or detach it from surrounding structures. Bands of fascia too strong to be ruptured with the finger may be divided with scissors. In the removal of tumors from the neck, no one but the experienced operator appreciates the strength and abundance of the fascias.

Tumors of the parotid gland itself are removed with great difficulty. If they extend from a level with the top of the ear to the top of the larynx, and from the mastoid process to the sub-maxillary gland, their complete extirpation is a formidable undertaking. The parotid gland in its normal state is not easily dissected from the cadaver. It extends from the zygoma to a point below the angle of the inferior maxillary, and is buried in a deep and narrow fossa between the ear and the ramus of the jaw. The facial nerve enters the gland deeply on its posterior aspect, and, after dividing into several branches, emerges superficially on its anterior aspect; consequently the gland can not be removed without a division of the nerve filaments, and paralysis of that side of the face as a sequence. The external carotid artery enters the gland from below and behind, at a point about an inch from its lower extremity, and, after reaching the middle of the gland, the vessel gives off the internal maxillary artery, and then continues upward as the temporal. The posterior auris is also given off from the external carotid in the substance of the gland. The superficial temporal vein enters the gland near the zygoma, and after receiving several branches in the substance of the gland,

FIG. 34.



Parotid Tumor.

escapes at its lower extremity as one of the jugulars. The internal maxillary, or deep temporal vein, finds its way through the gland in a direction downwards and backwards, and joins the internal jugular.

The removal of the parotid gland is inevitably attended with the division of the nerves, arteries, and veins just mentioned; and one of the chief dangers is from air entering the veins the moment they are cut across. Therefore, during the removal of a parotid tumor, it is best that the structures which can not be lacerated with the finger, shall be divided with scissors, in order to pinch, compress and bruise the veins, thus rendering them incapable of sucking in air.

Tumors of the parotid gland are frequently malignant in character and scirrhous in variety. As a tumor of this kind develops it rises out of the space usually occupied by the gland, and frees itself from the gland's deep fastenings. Besides, the tumor becomes so indurated that the external carotid and its branches shrink to trunks so unimportant in size as not to need ligatures.

The primary incisions should, when the tumor is large, be elliptical, embracing sufficient integument to leave no superabundance of cutaneous tissue after the tumor is removed and the wound is dressed. The removal of the tumor should, as a general thing, be begun above, a ligature being put upon the temporal artery as soon as it is reached or divided. When the internal maxillary artery is reached, it should be ligated; afterwards the tumor should be carefully isolated at its lower extremity, and so manipulated as to leave the external carotid as the last structure to be divided. This may be ligated and then severed, or twisted and afterwards divided with scissors.

In the removal of a parotid tumor, an instrument somewhat like a narrow chisel is useful in separating the morbid mass from the mastoid and styloid processes, and other unyielding structures, and in prying the tumor from its position. During the progress of the removal, the division of small vessels is not to be noticed, but the work of evulsion is to go steadily on.

If a parotid tumor be malignant it becomes a question whether it should be removed or not. It certainly should be let alone, until local and constitutional derangements have rendered an operation imperative. Sometimes a scirrhous tumor of the parotid is ten years in developing to a stage warranting an attempt at extirpation.

It has been asserted by those opposed to surgical interference, that it is impossible to remove the entire parotid gland, some particles of it remaining in the inequalities of its bed. Such opinions are usually formed while attempting to remove the normal parotid from the cadaver, but experimental knowledge derived from operations performed on scirrhous parotids, favors those who claim to have removed every vestige of the gland.

In some cases where the parotid tumor has been intensely hard, and therefore presumed to be scirrhous, the diagnosis has not proved correct, the disease turning out to be innocent in character. Nelaton, in a review of the diseases of the parotid region, speaks of abscesses, cysts, concretions in the salivary ducts, hypertrophy, benign tumors, and cancers, the last being by far the most common. He recommends excision of malignant tumors. Beclard and other writers upon parotid tumors have borne about the same testimony, though the results of their operations have not always sustained their theories in regard to the feasability of a permanent cure by operative measures.

Dr. Warren, in his *Surgical Observations*, recommends removal as the treatment for malignant tumors of the parotid; and cites a number of examples in which he has operated successfully, the disease never recurring. Dr. Geo. McClelland claims to have extirpated "*eleven entire parotids*, for various conditions of morbid action, and only one of the patients died in consequence of the operation."

It has been advised to tie the external carotid as a preliminary step to a removal of the parotid gland, but when the tumor extends down below the origin of that vessel, as it sometimes does, the ligation is impracticable. If the extirpation of the tumor be begun at its lower border, it is practicable to tie the external carotid when it is reached; and the remainder of the operation is comparatively easy, though the retrograde circulation, kept up by communicating branches, fills the wound with blood.

Malignant disease of the parotid gland occasionally extends to the lower jaw, and necessitates removal of a portion of that bone. The complication is a serious one, inasmuch as the cancellated tissue of the osseous structure may retain cancer cells beyond the line of excision. Malignant tumors of the parotid gland, which in their development extend to the thyroid gland below, to the pharynx in front, and to the side of the tongue, involving the sub-maxillary and sub-lingual glands, are too large and too intimately connected with important structures, to be safely removed. Even if the patient survived the operation, there would be slender hopes of complete recovery.

The treatment of fibrous tumors depends somewhat upon their location. When excision is practicable, it is undoubtedly the best method to be adopted. Tumors of the maxillary antrum may be dislodged by making an incision from the angle of the mouth, outwards and upwards, to an extent which will allow the upper lip and cheek to be turned up so as to expose the bone covering the tumor. The walls of the antrum are usually thinned by distension so that the tumor is easily reached. The removal of the morbid mass is not usually attended with dangerous hemorrhage. The return of the lip to its ordinary position covers the chasm in the antrum, and restores the normal expression to the face. Fibrous tumors of the nasal cavities (polypi) can commonly be removed through the nares by the aid of the finger and proper forceps. Fibrous tumors of the lobes of the ear are easily excised, unless the normal structure is entirely converted into morbid material. Usually enough healthy tissue can be saved to maintain the usual appearance of the lobe.

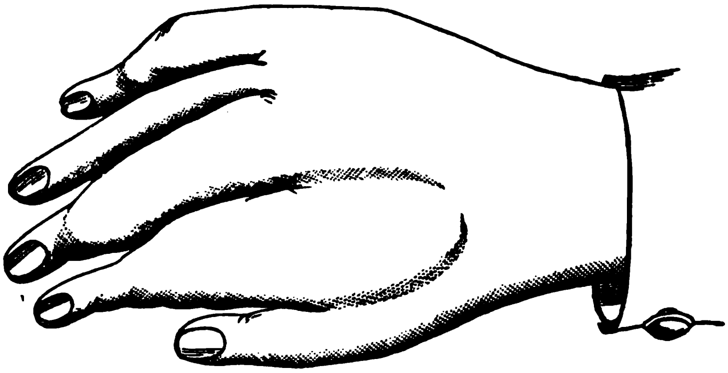
The neck is a favorite region for fibromata, and when deep and extensive in outline, the removal of such tumors constitutes formidable operations. A large fibroma of the cervical region may encroach upon several important structures, and disturb the functions of the mouth, fauces, pharynx, larynx, trachea, and œsophagus. The tumor, in its growth, may embrace large arteries, veins, and nerves, but it is more likely to crowd them aside; and this fact of displacement must be borne in mind during the operative procedure. Sometimes a fibrous tumor of the neck can be successfully enucleated, very little cutting, save the tegumentary covering, and unyielding fascias, being necessary or advisable. During the enucleation or removal care must be exercised not to tear a communication with the mouth, or pharynx; and not to incise large arteries, veins, and nerves. The knife is to be used as sparingly as possible; when cutting is to be done scissors are often safer than the scalpel.

Fibrous tumors of the thoracic cavity, are rarely removable, and those of the abdominal cavity can not be removed without performing gastrotomy. Uterine fibroids may be reached through the vaginal canal, in ways to be described hereafter.

Cartilaginous tumors (chondromata) occur most commonly in connection with the bones, and consist chiefly of hyaline and fibrous material. The bluish and glistening cartilage is seen when cut upon, and is enveloped in an abundance of connective tissue. It differs from true cartilage from the fact that the chondromatous tumor is vascular, while the normal cartilaginous structure is not. Large cells and cysts are sometimes found in chrondroma, and osseous material may at length convert the entire structure into bone.

The seat of chondromata is usually on the phalanges of the fingers; several digits may become affected at a time, so that the hand is useless. The bones of the pelvis are occasionally attacked with cartilaginous tumors, and the femur stands next in the order of invasion. The pedal extremities rarely suffer from chondromata. The disease is oftenest met upon the fingers of youth, the morbid action preceding puberty. The general characters of cartilaginous tumors are their shape, which is that of oval, nodular, and elongated masses; their hardness, which is resisting, and if compressible, there is a quick elastic recoil; and their location, which, as has been stated, is usually upon the phalangeal and metacarpal bones.

FIG. 35.



Cartilaginous tumors of the fingers.

Chondromata may form in several of the glands, as the testicle, ovary, parotid, etc., and they have been found in the sheaths of tendons. They may undergo ossification, or ulcerative softening. Exostoses frequently have their origin in chondromata, and cartilaginous material is found upon their growing surfaces. The chondromatous covering, when cut upon, is recognized by the bluish aspect of nascent structure.

Scrofulous subjects are more subject to chondromata than vigorous individuals. In one instance coming under my observation (the accompanying sketch was taken from this), there was also ulceration of the cartilages between several of the tarsal and metatarsal bones; and the patient belonged to a family having the lymphatic diathesis.

The treatment for chondromata is removal when such a course is practicable. In the case referred to I made a deep longitudinal incision into one of the fingers, the knife reaching the bone. The wound healed readily, and the operation arrested the growth of the tumor, but did not cause absorption of the chondromatous material already deposited. In one instance I amputated a finger which had a cartilaginous tumor the size of a hen's egg. The application of iodine externally effects little, yet the hypodermic use of the agent causes diminution of the morbid mass.

I once removed a chondromatous lump the size of an orange from one of the ham-string tendons, and there was no return of the disease.

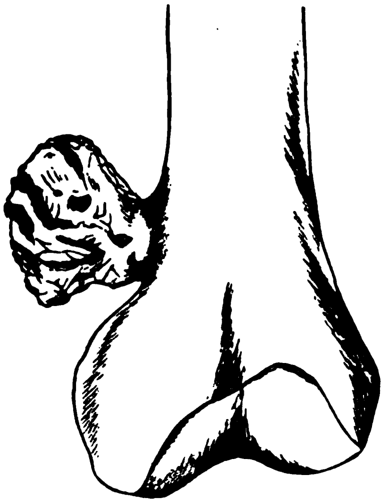
Osteomata, or exostoses, are bony outgrowths from the skeleton which may be either compact or cancellous. They may be osseous from the beginning, or chondromatous. Bony material has been found in tumors, glandular enlargements, and indurated tissues, as in ossification of the heart and arteries. Ovarian cysts have been known to develop tooth-like material, and so has the lining membrane of the maxillary antrum.

Osseous outgrowths from the flat and long bones may be spongy, like the bony tissue of medullary cavities, or exceedingly compact, like ivory. Those which spring from the skull are usually very hard, while those coming from long bones have some dense structure like the outside of the shaft of the femur, and a quantity of loose bony material which resembles the cancellated structures of the medullary cavities.

The spongy exostoses grow into the shape of a branch of coral, the tips being covered with a layer of hyaline cartilage. They develop in part from the bone, yet mostly from the cartilaginous periphery. The lower end of the femur is a common place for this variety of osteoma; and the tibia, fibula, and humerus frequently give rise to them. The base of tumors of this kind is generally smaller than the outgrowth at a distance from the seat of the disease. During development there is little pain or inconvenience produced by them. The limb may be weakened to a moderate extent, as the functions of the muscles passing the tumor are somewhat impaired by the interference of the irregular osseous projections.

Eburnated or ivory-like exostoses form on the bones of the skull, and do not attain a large size. Those coming under my observation have not been bigger than a large marble, and have presented a smooth, rounded outline. They do not usually encroach upon the inner table of the skull, but are developed from the outer table and the diploic structure. Their substance is so compact that it requires a saw to remove them, the gouge forceps being rarely competent to cut the ivory-like material very rapidly. During the operation of removal the saw should be made to entirely excise the osseous nodule, for an attempt to break an unsawed portion might result in a fracture of the internal table of the skull. At least, such an accident has been reported. In 1865, Mrs. Chadwick, of Bellevue, Ky., asked me to remove an exostosis of the occiput, near its junction with the temporal. I made a crucial incision in the scalp covering the tumor, and by dissecting the flaps, exposed the base. I then removed the nodule with a saw, and was astonished to find that the instrument cut so slowly, and that so much effort on my part

FIG. 36.



Exostosis from lower extremity of femur.

was required to make appreciable progress. Upon examination of the tumor after it was removed, I found the outside much the densest, there being some cancellated tissue in the centre. The wound made by the operation healed auspiciously, and in after years there was no return of the osteoma.

Ivory-like exostoses form on the scapula and pelvic bones. The metatarsal bone of the great toe is subject to an osseous outgrowth of the phalangeal extremity, in connection with a bunion. There may be osteomatous developments of notable size at points on the skeleton where muscles are attached.

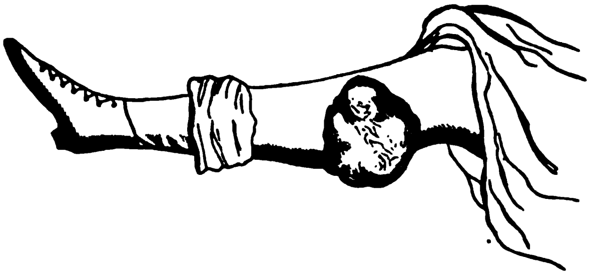
No plan of medication has succeeded in removing exostoses. The topical use of iodine, and the systemic employment of the iodides, have failed to make appreciable impressions. Excision is the only method of cure that has proved reliable, and this is not without its dangers in some instances. If the exostosis be near a joint, the articulation may be damaged in the operation; and there is danger of septicæmia in all cases. Billroth says: "I once allowed myself to be induced, by the entreaties of a patient, to remove an exostosis from the lower end of the femur with a large mucous bursa; the patient died of septicæmia." Stanley had a similar case, the patient dying at the end of the third week from suppuration and constitutional derangement, there being rigors, collapse, pain in the head, cramps in the limbs, and extreme prostration of nervous power.

In Sept. 1874, Miss Susan Schwab, twenty-two years of age, consulted me concerning a tumor in the calf of her leg. Upon examination I found the osseous outgrowth as big as the fist, or larger, having its attachment on the posterior aspect of the tibia four or five inches below the knee. The exterior of the tumor was very rough, branching like coral. Some of the prominent points pushed out the skin, so that the clothing chafed the integument covering the eminences. I made a pencil sketch of the limb at the time; and the accompanying wood-cut was taken from it.

At first it was difficult to determine whether the disease arose from the tibia or fibula, as the tumor seemed to reach from one bone to the other. But it was presumed to spring from the tibia, and operative measures confirmed the soundness of the presumption.

The patient set a time when she would have the tumor removed, and on Saturday, Oct. 10th, I excised the morbid mass. After making an incision in the skin covering the tumor, I circumscribed the lump with my finger, and found it independent of the fibula, and an outgrowth from the posterior aspect of the tibia, with a base nearly as thick as a man's wrist. As the osseous shell of the base or pedicle was very dense I perforated it in several places with a hand drill for boring bone, and with gouge forceps cut the spaces between the holes. After removing the osseous mass, I cut away all spicula, and made the space recently occupied by the tumor quite smooth. Everything was seemingly favorable for a successful result; an insignificant amount of blood was lost; no important vessel or nerve was wounded; and the patient rallied well from the anæsthesia. The sides of the wound were drawn together with silver sutures, and the deeper walls of the cavity pressed together with adhesive strips and a bandage. The angles of the wound were left uncovered to facilitate the escape of fluids, and directions given to so dress the limb as to favor the discharge of pus or other liquids. On Sunday, Monday, and a part of Tuesday, the patient was in a happy mood, laughing and joking as if nothing serious was impending. Towards evening, on Tuesday, she experienced a rigor, and soon suffered an attack of vomiting, which was followed by fever, prostration, and agitation. Delirium supervened, and symptoms which threatened speedy dissolution. The wound was opened, but neither pus nor putrid blood was discovered, though a putrescent odor arose from the limb. A puffy swelling extended from the wound to the groin, even the external genitalia participating in the tumefaction. All the features of the case indicated septicæmia in a severe form, though there was no special reason to anticipate any such condition. There was in the case

FIG. 37.



Exostosis of the tibia.

no more reason to suspect blood poisoning than after an ordinary amputation, where the flaps are brought together with sutures, supported with adhesive strips, and steadied with a bandage. Probably no amount of watchfulness will always avert septicæmia in every instance. Thorough drainage is among the best means to avoid the fermentation of blood and other fluids in a deep wound, pouch, or cavity where liquids may accumulate.

Means were instituted on Wednesday and Thursday to antidote and counteract the animal poison, and to sustain the patient until the virus might pass off by elimination, but the load was too heavy to be borne. The patient sank under it, and died on Friday. As has been stated, there was nothing in the nature of the operation to create alarm—a favorable result was predicted, and the friends were shocked by the untoward event. But death has occurred from more trivial operations—the extraction of a tooth has been followed by a fatal termination.

Death has followed the removal of exostosis of the tibia in several instances: In 1794, according to M. Champion, an eminent French surgeon (Moreau) lost a patient soon after removing an exostosis of the tibia. The tumor was removed with gouge, chisel, and mallet; and the result at first promised well. But in three or four days the patient (a peasant girl) took a chill, then quickly sank and died. These cases would seem to indicate that there is serious danger in the removal of a bony outgrowth from the tibia—but such is not warranted by experience. The excision of exostoses is of daily occurrence, and rarely is there an untoward result. It is worthy of observation that the removal of osseous outgrowths from deep parts, is the most dangerous. Undoubtedly a share of the peril comes from imperfect drainage. However, an analysis of cases shows that surgeons have had the happiest results after removing exostoses from the femur, and from the tibia near the calf, where the tissues are deep, and have closed the wounds snugly with sutures, plasters, and bandages, leaving no means of escape for purulent and putrescent fluids. Bourqueneau reports a case in which the wound healed by the "first intention," after the removal of an exostosis of the tibia.

Velpeau says, while discussing the removal of exostoses, "I would lay it down as a precept, whenever immediate reunion, and without suppuration, can not succeed, that we should not attempt the cure of the wound by first intention, but confine ourselves to keeping it slightly open by means of small balls of lint, until it is perfectly cleansed. Two patients of A. Cooper did not recover without causing some uneasiness; and that of M. Roux, who, though he was young, of excellent constitution, and in perfect health, ultimately perished." These were cases of exostosis of the femur.

Stanley says: "After the removal of an exostosis, especially when deep seated, it is not expedient to approximate the divided edges of the integument, in the view of obtaining their adhesion; since, in the exposure and removal of the tumor, so much injury is usually done to the surrounding cellular tissue, that suppuration through it will almost certainly ensue. The wound should be simply covered with folded damp linen; and, by this means, the healing of it will be completed in a shorter time than if the adhesion of its sides had been in the first instance attempted."

Exostosis of the last phalanx of the great toe is to be removed, when troublesome, by first removing the nail, then splitting the flesh to the bone as far back as the nail grows. The two flaps are then to be crowded laterally, so as to allow bone nippers to divide the phalanx transversely behind the exostosis. The flaps are then to be brought together, and bound there with adhesive strips. The operation, thus performed, does not interfere with the flexor tendon of the great toe which is so important in working.

Important organs in contiguity with exostoses, may be seriously affected. An osteoma growing from the inner side of the humerus may interfere with adjacent nerves and blood vessels. Such a tumor has caused severe pain in the fore-arm and hand by pressure upon nerves distributed to those parts. Andral relates a case in which deglutition was rendered difficult by pressure on the œsophagus produced by an exostosis growing from the body of a vertebra. Dr. Reid reports a case of fatal compression and softening of the spinal cord, which arose from an exostosis of the odontoid process of the atlas.

It is thought that exostosis of the inner table of the skull has proved the exciting cause of epilepsy; and trephing, to remove the bony tumor, has been suggested as a cure. Boyer relates the circumstance that an exostosis growing from the inner aspect of the os pubis, compressed the neck of the bladder, and proved an insuperable barrier to catheterism.

Glandular tumors, or adenomata, are to a considerable extent, simply hypertrophies, the neoplasm imitating the structure in which it has its origin. Enlargement of the thyroid gland—bronchocele—is an example of adenoma. Overgrowth of the mammary gland is not uncommon; and hypertrophy of the prostate is spoken of as a morbid state of frequent occurrence. Tumors grow on the surfaces or in the substance of glands, and are encapsuled masses somewhat distinct from the glands themselves; and whenever thus developed they are not properly glandular tumors. A morbid mass which happens to develop near a gland, and is nourished independently of the glandular structure, is not necessarily an adenoma. But what is worthy of remark, tumors which develop in proximity with glands are apt to imitate the physical character of the structures with which they are intimately associated. This would seem to indicate that there is a close relationship between the tumor and the natural organ. I am convinced that a tumor beginning as an independent growth in the vicinity of the parotid gland may at length involve that structure so completely that the tissues of both become one and indistinguishable.

Lymphatic glands occasionally enlarge until they reach the size of hen's eggs, and lose their original characteristics. They may preserve their round or oval shape, and their yellowish white color, but otherwise present the appearances of fibrous tumors.

Nasal, uterine, and rectal polypi are ordinarily overgrown mucous follicles, and their removal is rarely radical, there being a tendency to recurrence. However, the repeated application of persulphate of iron to the remnants of the pedicle may obviate a return of the disease.

Glandular enlargement of the ovary is prone to become cystic, though a compound or complicated state is not infrequent. Cysts are often found in adenoma of the thyroid, especially in that form of the disease called goitre. In the narrow valleys and defiles of the great mountain ranges of Europe and Asia there are thousands of cretins who, among other deformities, have monstrous developments of the thyroid gland, so that the adenomatous difficulty has been pronounced the essential feature of cretinism. But this has been denied by Billroth, a competent observer. He says: "Goitre is chiefly remarkable for its endemic occurrence; it is found mostly in mountaineers; it is seen in the Hartz, Thuringian, Silesian, and Bohemian mountains, and in the Alps, although not equally frequent in all parts. Some valleys of Switzerland and of the Austrian Alps are entirely free from it. It has been ascribed to the most different causes, especially to the water and soil, without any definite scientific reason having been found by accurate investigations. Undoubtedly, climatical and geological conditions have much to do with this disease. Complete similarity in the constitution (probably often hereditary) of goitrous patients can hardly be proved; a certain connection with cretinism can not be denied, inasmuch as most cretins have goitre; but the disease is most frequent in persons with well-developed bones and brain."

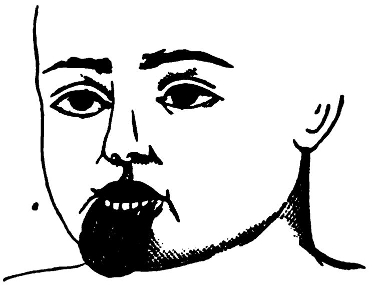
A moderate degree of thyroid enlargement is frequently seen among women of a strumous diathesis, but it is rare to meet a well-developed goitre in America; and the mild form of the disease is as common in prairie regions as among the mountains; so that, as far as this country is concerned, deep and narrow valleys, lofty peaks, and the waters of melting snow and ice, have no influence which affects the thyroid gland.

Adenoid tumors may sometimes be extirpated, though a greatly enlarged thyroid, with its excessive vascularity, presents a formidable obstacle to surgical interference. The topical and systemic use of iodine commonly arrests the progress of the disease. Injecting a bronchocele with tincture of iodine, a hypodermic syringe being used, will often remove it faster than external applications. A fluid drachm of the medicine may be used at a time; and the operation be repeated every week. There is generally little danger in the extirpation of enlarged mammary glands, when, from their enormous size, inconvenience, and discomfort, removal is deemed proper or necessary. Those enlargements which are free from pain, and have ceased to grow, may be judiciously allowed to remain as they are. However, the fear of transformation to malignancy is apt to disturb the patient's mind to an extent which justifies extirpation.

I have occasionally removed enlarged lymphatic glands of the neck for the cosmetic effect; and such operations should be performed when the functions of the region are disturbed by the presence of the tumors. It is sometimes proper to excise a hypertrophied or adenomatous tissue, especially when the weight of the morbid mass is grievous to be borne.

Vascular or erectile tumors—angiomata—are such as appear to be composed chiefly of minute blood-vessels held together by a slight amount of connective tissue, and ordinarily called nævi, or " mother's marks." Their common seat is in the skin and subcutaneous tissue; and they may reach the vermillion of the lip, where a puffy tumor is more likely to be formed than in the ordinary integument. When quite diffuse or wide-spread these vascular excrescences are denominated port-wine spots, brandy splashes, spider-marks, and the like. They are bright red, cherry colored, or steel blue; and nearly the whole structure involved in the disease consists of dilated and tortuous capillaries, and a great part of the mass has a cavernous, spongy conformation, like the erectile tissue of the genitalia.

FIG. 38.



Anastomotic nævus of the under lip.

The removal of these spongy masses from the lips is not always attended with success. In a case in which the tumefaction is of the under lip, and the mass is chiefly supplied with blood from an artery coming from the sulcus between the lip and the jaw, it is well to ligate the vessels by sending a needle beneath them and then forming a knot. If this lessens the size of the tumor in the course of a few days, the tumor may be removed with scissors, and the lip restored to its original position by means of adhesive strips that reach from one angle of the jaw to the other, and support the structures as they pass the median line of the lip. If the artery be not ligated, and any portion of the spongy mass remains, a return of the growth may be expected. The use of per-chloride of iron may constringe and tend to obliterate a developing nævus, but in some instances the tenden to grow on the part of the morbid mass, will baffle the best directed efforts to extinguish the disease.

Moles having a brownish discoloration, and unsightly hairs growing from them, may be excised by elliptical cuts, and then the edges of the wound can be drawn together with sutures and plasters. A small nævus or mole may be destroyed by the application of fuming nitric acid, the end of a stick being used to apply the caustic.

Some vascular tumors are too extensive to be removed by any means. I have seen a nævus which covered one-half the face, involving one-half the forehead, eyelids, nose, lips, and chin.

Neuromatous tumors are composed entirely of nerve filaments. They occur chiefly on the stumps of nerves in amputated limbs. A neuroma is often so painful that the lump has to be exposed by dissection, and the knot removed by excision. A fibrous tumor surrounding a nerve is not a true neuroma, yet it may appear such, be painful, and require excision of the mass, the included piece of nerve being removed with it. Neuromata of the nerves of the face are usually small, and attended with excruciating pain. In *tic doleureux* a neuroma the size of a kernel of wheat may sometimes be discovered by carefully manipulating the tissues affected. If a sensitive nerve tumor can be found, it may be well to excise it. Subcutaneous division of the nerve on each side of the neuroma would serve the same purpose.

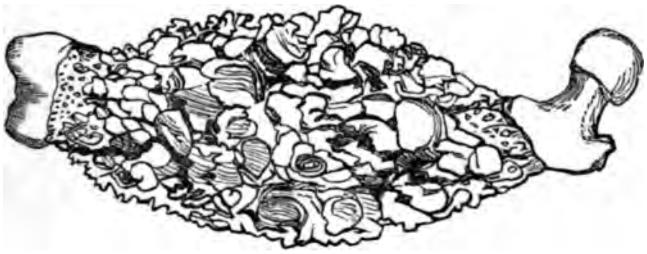
Sarcous tumors—sarcomata—are morbid growths of a degenerate nature which usually have an abundance of large cells, and affect all the tissues of the part impressed, as muscle, nerve, vessel and bone. At one time they were called osteo-sarcomata to indicate the disposition of the disease to transform the fleshy and bony structures into tumor material. The morbid action in such growths is very lively, destructive and devitalizing transformations occurring in a few weeks or months. In some instances the morbid processes resemble those of carcinoma; and, in fact, the two diseases may be associated in a given case.

Sarcomatous growths occasionally present pigmentary spots which give the development a brown or black appearance. The skin may not be affected, but the discoloration shows through the integument. In shape sarcomata are round, oval, or lobed; and in consistence they may range from a state as hard as scirrhus, down through a flesh-like firmness, to a gelatinous fluidity. Sometimes a sarcoma is exceedingly vascular, then again there is a paucity of vessels, and they are venous and cavernous. Medullary sarcomata are not uncommon, a large part of their contents resembling brain. When a bone is involved, osseous shoots, like moss or sponge, transform the original structure into a mass of cells and cysts.

Sarcoma frequently attacks the maxillary bones, and produces hideous deformities of the face. And, what is unfortunate, removal of the affected parts is not always followed by a permanent cure, the disease, some time subsequently, attacking the lungs or other viscera. Epulis is a species of sarcoma.

The femur is a bone which is apt to take on sarcomatous development, the disease being called "bone-cancer" by those little acquainted with the pathological characteristics of true sarcoma. I once amputated the thigh near the trochanters to get rid of an extensive sarcomatous development of the shaft of the femur. The patient was a girl fifteen years of age and extremely emaciated. After the operation she recuperated rapidly, and in the course of six months seemed to have fully recovered; then she began to decline, and died of secondary developments of a sarcomatous nature in the abdominal viscera. From the nature of the osseous structure involved in sarcomatous developments, it being like diploe, the disease has been called myeloid. But as the morbid product is often free of osseous material, especially when located in the mammary gland and testicle, there would be little propriety in calling it a myeloid tumor. On the other hand a sarcous growth etymologically signifies one that is fleshy, as opposed to that which is osseous. The old compound term—

FIG. 39.



Osteo-sarcomatous femur.

-sarcoma—expresses the complex nature of the physical

f the disease.

The periosteum is occasionally the seat of sarcomatous action, and in that event the development is outwardly, and the deeper layers of the bone escape extensive transformation. Periosteal sarcomata, when at a distance from the articulations, are removable, though there is never a certainty that the disease will not reappear in the same place or some other part of the body.

CARCINOMA, OR CANCER.

Carcinoma is a name given to a familiar disease, which in its constitutional impressions manifests a devitalizing tendency, and in its local action exhibits a destructive hostility to adjacent healthy structures. Whether the disease begins in the blood, and, after undergoing certain changes, at length reaches a stage when localization becomes a necessary phase in its career, or commencing locally it then elaborates sufficient virus to contaminate the entire organism, is a question which has not been fully determined. It has been observed that there is little constitutional disturbance until a morbid local manifestation has occurred. The first sign of cancer is generally in a circumscribed spot, and the earlier phases are developed while the bodily functions are in a state of vigor. A woman in extraordinary fine health, at the age of thirty-five, showed me a lump in her right mammary gland, and asked me what I thought of it. To allay her fears I answered that such lumps were often entirely harmless, and that she had better think nothing about it. In three months the tumor was as big as a child's fist, the nipple retracted, and her general health decidedly impaired; in a year she died of cancer. Now, if the disease began its career by contaminating the blood, it failed to make its presence known until the local manifestation indicated danger.

In some instances the local manifestation is not observed until the patient has shown an anæmic, sallow, and debilitated expression for months. Perhaps the malignant taint was the cause of the vital decline, and the succeeding localization was a feature in the progress of the disease. It is possible that the debility depended upon other causes, and the carcinomatous poison embraced the opportunity, while the conservative forces of the body could offer little resistance to the specific invasion, to fix itself in some point where the vital condition was deranged or feeble.

The fact that carcinoma is hereditary would seem to prove conclusively that the disease is of the blood; on the other hand, it may be asserted with some degree of plausibility that all diseases which are considered hereditary may not necessarily be of the blood, but the members of a family are so constituted that they are unusually impressible, or susceptible to invasion on the part of certain taints or poisons. The children of some families are prone to have worms, but it can not be claimed that the parasitic germ is transmitted from parents to offspring. The condition of body is handed down from one generation to another; and at a certain age, when the intestinal track is in the fittest state for the reception of parasitic germs, and the propagation of worms, the verminous difficulty is sure to occur. All children receive the ova of parasites in one way or another, yet if the alimentary canal be not in a favorable condition for the hatching of the eggs and the development of the parasites, the child escapes the invasion. Eczema, syphilis, and scrofula are undoubtedly transmissible from parent to progeny, but cancer may, in transmissibility, be restricted to bodily conditions, as is the case with entozoa.

It is generally admitted that phthisis is hereditary, but, in a consumptive family, what is transmitted from parent to child? Is it tubercle, or the bodily condition which, at a certain age, favors the development of the disease? It is stated that vesicles containing germinal cysticerci and trichinæ have been found in the flesh of newborn infants, but the probability is that some mistake has crept into the observations. The admittance of such a fact would necessitate the belief that the germs, floating in the maternal blood, passed through the meshes of the placental chorion, and after entering the umbilical veins, gained access to the fœtal tissues. While nutritious fluids may thus, by the dynamics of vitalized membranes, reach the vessels of the placenta, it is too much to believe that distinct organisms, as cysticerci, can make the transit.

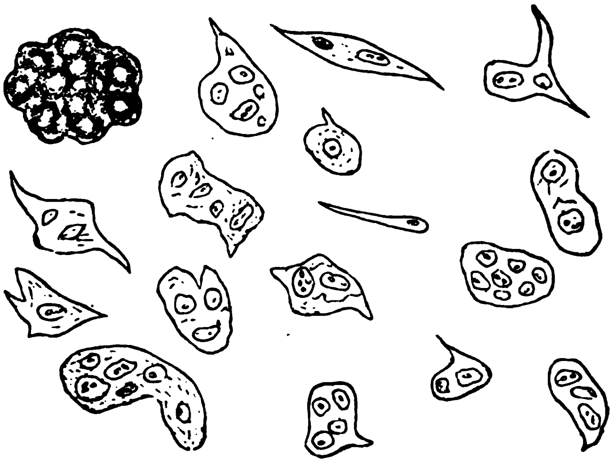
There does not seem to be an insuperable objection to the theory that cancer-germs, which may be as minute as the ova of intestinal parasites, may gain access to the areolar tissues of the human body; and once introduced into the animal economy they may abide there for years before the systemic condition is favorable for evolution or an active display of the powers of the disease. The degeneracy or perversion of a single cell in the healthy body may be enough to start a carcinomatous growth. Possibly it requires a systemic condition favorable to the development and reproduction of the perverted cell, for it is impossible to develop a cancerous germ in some individuals, though a piece of skin studded with cancer cells be transplanted, and made to grow in the persons receiving the tainted tissue. The cancer virus will not poison all people. Some families are quite exempt from the contagion of syphilis, while others easily receive the virulent properties of the disease, and are fearfully shattered by its devastating influences.

The microscope has done considerable toward a better understanding of the anatomical characteristics of carcinoma. By means of the instrument it has been determined that cancer tissue is largely made up of cells, the shape and other peculiarities of which indicate pretty conclusively the type of the disease. The shape of a cancer-cell is sometimes even or regular, but tends to a multiplicity of irregularities. In a group of cancer-cells a variety of shapes may be observed. One cell may be flask-shaped, a second oblong, a third nodular, a fourth acuminate, a fifth fusiform, a sixth caudate, and so on, to an indefinite variety in form or outline; and the contents of the cancer-cells are quite at variance with those peculiar to cells of a benign character. Some cancer-cells possess a single nucleus, and that a solitary nucleolus, as is the rule in regard to healthy cells, yet the majority present two or more nuclei, and each nucleus may contain two or more nucleoli. These characteristics are considered as distinctive, though it may require an expert microscopist to observe the distinguishing features.

The shape of cancer-cells depends much upon the loose or dense character of the structure in which they are found. In scirrhus they are compressed into caudate and fusiform masses, and have no opportunity to expand into typical forms, if there be such in carcinoma; and in medullary and fungous growths the texture is so soft that the cells are apt to take oval, oblong, and flask-like forms.

Inasmuch as cancer-cells are not often examined until after the excision of a carcinomatous mass, their shape and other characteristics lose that importance in a diagnostic point of view which these features would otherwise have. To be sure, it is of interest to know, after a tumor is excised, whether the morbid product be of benign or malignant character, yet as long as the disease is incurable, the revelation would not aid much in the treatment. It is of vastly more importance to determine the nature of a tumor before an operation is undertaken, or any plan of treatment is adopted, consequently external signs must be made to serve as valuable a purpose as possible in forming opinions concerning the character of tumors. In order that the microscope may be of any importance in the diagnosis of tumors the instrument must be in experienced hands. Sometimes cancer-cells appear, when viewed through a powerful magnifier, much like the cells of innocent growths. An inexperienced microscopist can not tell the starch granules of a roasted potato, from the mucous globules of the bronchi, therefore any attempts of his to discriminate between the cellular elements of adenoma, sarcoma, and carcinoma, would not be entitled to serious consideration.

FIG. 40.



Outlines of cancer cells—greatly magnified.

If a thin slice of cancerous tumor be microscopically examined, the attention of the observer will be directed to what has been denominated the "connective tissue," which is a mesh, or network, having cellular spaces which are called alveoli. The interstices of the connective tissue will be seen crowded with cells having large nuclei, with large and bright nucleoli; but it requires close attention and experimentation to find a cell which distinctly shows its cancerous character, first, by its shape; and, secondly, by its contents. Cancer-cells have the outline and internal constitution which are observed upon the epithelial lining of healthy secreting glands. Then, again, the "connective tissue" is not decidedly unlike that prevailing in benign tumors. Ordinary areolar tissue studded with tubercular deposits appears very much like certain parts of a malignant growth, yet the typical carcinomatous structure can generally be distinguished from any benign product. The discrimination is not made by comparing parts in which there is a close resemblance, but in contrasting those which exhibit the greatest variation.

Dr. Bryant, in his *Practice of Surgery*, while introducing the subject of *cancer*, begins thus: "What is a cancerous tumor? of what is it composed? and how is it to be recognized?—are three questions which the student is constantly asking, and there are few which are more difficult to answer with accuracy or precision. Pathologically, a cancerous tumor is *not* composed of any definite or characteristic elements, such as at once stamp it as being a cancer; it does not contain any distinct cancer-cells which mark its nature, for the cells, nuclei, and fibres which enter into the formation of a cancer, may all be traced in other and in innocent morbid growths."

Upon scraping the section of a carcinomatous tumor, a creamy or whey-like "juice" can be removed; the fluid is bluish white, and tinted red by the admixture of blood globules. This liquid is thought to be diagnostic of cancer, yet alone as evidence of carcinoma, it would not go far. Thus it is with several of the phases—one is not convincing, but the combination of several renders the proof quite decisive. The "juice" is constituted of serum, cancer-cells, granules, oil globules, and the *debris* of a disintegrating process. The free cells of cancer-juice can easily be made translucent by the addition of acetic acid to the fluid. The nuclei can then be easily recognized, as well as the nucleoli.

A patient affected with cancer loses the glow and hue of robustitude, and takes on a pinched, yellowish and sodden aspect. The nails show incurvation as in phthisis; the superficial veins on the front aspect of the wrist, appear to convey blood the color of reddish wine; the flesh wastes; chills and night-sweats are experienced; fever and restlessness come on; the strength diminishes; pain is felt in the local development; faulty nutrition and anæmia become strikingly apparent; and the presence of a fatal disease can not fail to be recognized.

A cancerous growth can generally be diagnosed by features peculiar to malignant tumors. The veins passing over the morbid mass are dilated, and their walls seem to be thin; the tumor appears unusually hard, and firmly fixed, as if it was inclined to become fast in the dense and rigid structures; it rarely develops with a round, oval, or uniform surface, but is nodular or lobulated; the lymphatic glands in the immediate vicinity are commonly enlarged and sensitive; the pain is darting, twinging and too pungent for an innocent tumor; often the capillary vessels are prominent, and seem like rootlets, or the legs and feelers of a crab—hence the name cancer, signifying crab. However, the vascular peculiarity which has given the disease its name, is not always observable.

Cancer seems to invade the natural tissues by infiltration, and then to convert the adjacent material into structure like its own; and the healthy tissues have not the power to resist the encroachments of the disease. It has the ability to transform bone, cartilage, ligament, fascia, tendon, muscle, and skin, into its own peculiar organization. Innocent tumors respect healthy structures, merely displacing or compressing them; but cancer transforms and appropriates indigenous parts with a hostility which is fiendishly destructive.

Although malignant tumors manifest such a faculty of growing, their materials are never elaborated into an enduring structure. The organic or anatomical constituents of cancer, such as cell, nucleus, nucleolus, fibre, fluid, and connective tissue, exist in innocent tumors, but not in such combinations, and with such powers of reproduction as in carcinomatous growths. Yet, with all these endowments, cancer structure does not possess stability, but readily yields to escharotics and disintegrating influences. While the nascent portions of the tumor are extending themselves rapidly, the older parts are as hastily melting away through sloughing and ulceration.

Cancer destroys life by establishing fatal anæmia, which is accomplished in part by thwarting the nutritive processes, and by direct interference with blood-making; it brings about exhausting hemorrhages; it further reduces the strength through pain, anxiety, and loss of sleep; it often kills by obstructing some canal, the perviousness of which is essential to life, as the respiratory and alimentary tubes, and the urinary outlets; it may obliterate ducts and thus bring about a fatal issue; cancer is also destructive to life when it lays open canals and cavities, as the œsophagus, stomach, and bladder; and it contributes in the work of death by establishing diarrhœa, and wasteful discharges; in brief, it hastens the vital overthrow in more ways than can be enumerated.

Cancer, in its primary form, rarely locates itself in two places at the same time. It has been known to attack both eyes at about the same period, also both mammary glands, but the sympathy and intimate association of these double organs may be considered a satisfactory explanation of the seeming variance from what is ordinarily an established rule. What are called secondary growths, or such as follow excision or destruction of the primary or original tumor, may appear in several different organs at the same time.

Cancer so frequently begins its local evolutions in a scar, ulcer, bruise, innocent tumor, or spot which is habitually irritated, as the edge of the tongue on a rough tooth, or the under lip chafed with the stem of a clay pipe, that an accidental origin has been often ascribed to carcinoma. But from what has been already said, it is not improbable that the germs of the disease are lurking in the blood or fluids of the body, and embrace the opportunity to fix themselves, in order to complete their destiny. Women so often die from cancer of the breast, that every lump and nodule in that region is regarded with suspicion; yet if such patients would realize that innocent growths are likely to remain such, and that the early excision of a cancerous tumor affords little security against a recurrence of the disease in that or some other region, they could not be frightened into summary measures.

While a cancer is an open sore, or has an opportunity to cast off and discharge its worn-out fluids, cells, and structures, and has room for the development of its young and growing elements, the disease seems content to remain in the location where it started; but if hemmed in or circumvented in any way, secondary forms of the disease may be looked for in other localities. However, there are exceptions to this rule; in a few instances, solitary cancers which never opened, have remained in the covered state for years, or to the end of life. In such cases there is little vigor in the tumor, the morbid mass continuing in a dormant state.

Carcinoma is disseminated in the body, from the primary to secondary forms, through the medium of the lymphatic system of vessels and glands; and it travels in the course of the lymphatic circulation, and not against its currents. And after the poison has reached the end of the thoracic duct, it passes into the veins, and then fixes itself oftenest in the lungs; next in affinity to receive secondary deposits is the liver, then come the bones, and later the spleen and the kidneys. However, it makes some difference where the primary manifestation is located—if in the lower extremities the liver is first impressed with secondary deposits, while primary cancer of the upper extremities and of the mammary glands, is oftenest succeeded by secondary invasion of the pulmonary organs.

It is observed that the morbid operations of cancer are more active in the young than in the aged—a fact which serves to show that the vigor of the disease is gauged somewhat by the vital activity of the victim; yet improvement of the health through judicious medication does not feed the disease, but retards its activity in a marked degree. During the period of life when the vital activities are prominent, cancer is comparatively rare, while at forty or fifty, especially in the female whose reproductive organs decline in importance, the disease begins to appear more frequently than during younger life.

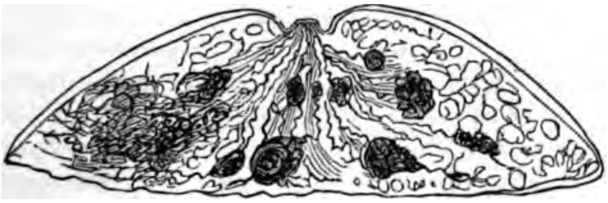
Cancer is not prevented nor altered in its course by the presence of other diseases; it has been observed in patients suffering from syphilis, from skin diseases, phthisis, Bright's disease of the kidneys, erysipelas, caries of the spine, and serious disorders of the liver. Neither abstemious nor luxurious feeders appear to be exempt from the inroads of carcinoma. However, the enfeebled from any cause are more liable to the disease than the robust. Condition of life and vocation exert little influence over the introduction or career of cancer. Chimney sweepers may form an exception to the rule; they frequently suffer from a peculiar form of the disease. Those people who live in a savage state are seldom affected with cancer, though less is known of their diseases than of those in civilized countries. It is highly probable that out-door life, and a simple diet, would tend to avert many of the ailments which affect the inhabitants of thickly settled communities.

Scirrhus is the most frequent form of cancer; and is oftenest observed in the mammary gland of the female. Its favorite sites are also the parotid gland, the eye, the colon, the uterus, and the rectum. Scirrhus signifies hardness, and is the densest example of cancerous structure, except the osteoid. When a scirrhous tumor is manipulated it presents to the fingers a stony hardness. Scirrhus infiltrates the normal tissues and draws them closely to itself, compressing and condensing them, so that the infiltration and the structures impressed do not always occupy as much space as the original tissues. The " connective tissue " of scirrhus lays hold upon the fascias and unyielding structures, so that the morbid mass seems firmly fixed in its situation, and refuses to move unless considerable force is employed in the effort. Scirrhus of the female breast shortens the lactiferous ducts and thus retracts the nipple; or, if located at a distance from the centre of the mamma, and has little to do with the glandular structure, it contracts the fibres running to the integument, and thereby throws the skin into minute dimples. When scirrhus of the breast is quite extensive it tends to fasten the gland to the pectoral muscle, so that the mass can not be slid about as freely as when in the normal state.

The exterior of a scirrhous tumor grows more rapidly at one place than at another, hence it offers a nodular surface; besides, small tumors in the vicinity which may have been infected lymphatics, enlarge until they join or coalesce with the original tumor, a circumstance which contributes to the lobular character of the morbid mass. Scirrhus develops slowly, months being consumed in producing much appreciable enlargement. The tumor in its earlier evolutions may give no pain except an occasional twinge, and may provoke no inflammatory symptoms; but from some cause not always demonstrable, greater activity will become manifest in the tumor, so that the patient takes alarm, and resorts to cooling and anodyne applications. Such treatment may allay the temporary excitement, and give the absorbents an opportunity to remove some of the inflammatory lymph. For awhile the tumor seems to subside, and the patient cherishes hope that proper medication may remove the entire lump. However, the season of repose and seeming subsidence is followed by renewed activity in the tumor, so an actual gain in the size of the morbid mass becomes unquestioned. Pain which at first was paroxysmal, is nearly constant, and so severe at times as to demand quieting remedies. If the tumor be of the breast, the skin covering it gets attached to the indurated mass, loses its natural color, and becomes purple, papillary and shining. Enlarged capillaries and veins stud the integument constituting the outer surface of the tumor; cracks or fissures form, and these degenerate into ulcers. The work of disintegration has now begun, and a constant discharge of irritating and offensive ichor is kept up. The nearest lymphatic glands show enlargement and increased sensibility. The patient begins to manifest the debilitating effects of the disease, experiencing emaciation, loss of strength, rigors, night sweats, hectic, and that train of symptoms which attend a severely prostrating disease.

While one part of the tumor is melting away by liquefaction, disintegration and sloughing, new morbid material rapidly accumulates at its base and borders. The productive and destructive processes are carried on at the expense of the healthy tissues and functions, so that the work of exhaustion is swift and sure. Hemorrhages become frequent and debilitating; and every change seems to give the disease greater and greater advantage over the conservative forces of the body. If the location of the tumor be such as to have its growth upon a natural channel or outlet, the mechanical obstruction contributes to the destructive process. Scirrhus of the pylorus, cæcum, or anal apparatus, has its fatal tendencies greatly multiplied; while if restricted to some less important structures the vital powers may assert their supremacy for a much longer period. Scirrhus of the parotid, the mamma, or the testicle, usually runs its course, if unmolested, in two or three years; and in some instances a much longer period has been passed before the fatal issue. Scirrhus of any portion of the alimentary track terminates fatally in a period ranging from six to eighteen months.

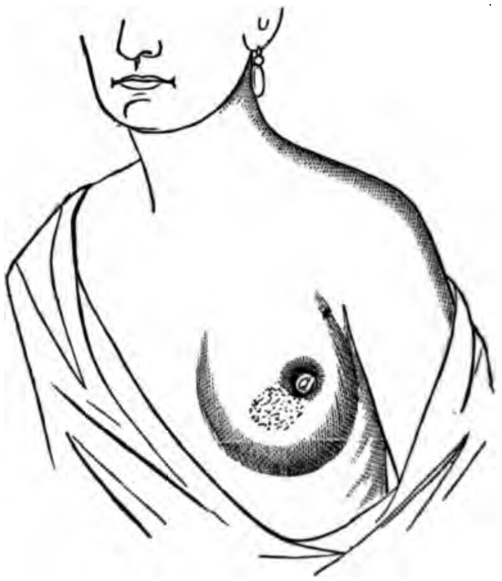
FIG. 41.



Section of mammary gland, showing carcinomatous deposits, and retraction of the nipple.

When a scirrhous tumor the size of a child's fist is excised, and sections of it are made and examined, it will be found to resist the knife like leather, and the divided surfaces appear of a bluish-white color, fibrous and cheesy in construction, scanty in vessels, and concave from a hollowing or drawing in of the cut-faces. When a section is scraped with a knife, and pressed at the same time, a thin, turbid, serous-looking fluid escapes, which, for the lack of a better name, is called "cancer-juice." Upon microscopic examination the fluid is found to contain granular matter, cells and nuclei which have escaped from ruptured cells.

Fig. 42.

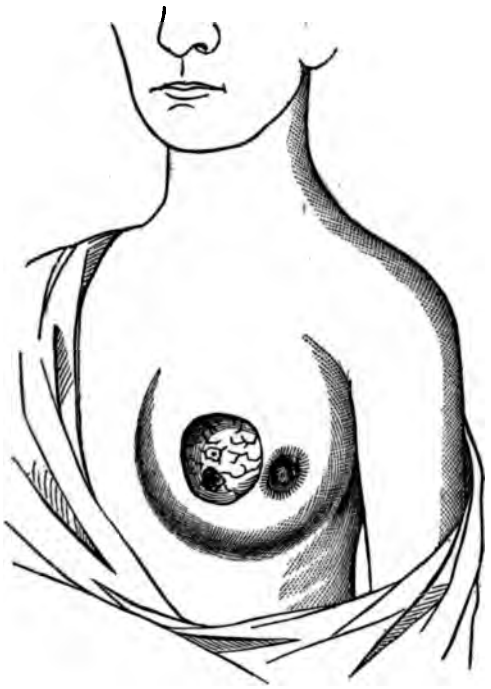


The shading on inside of nipple shows the presence of a scirrhous tumor.

It is not often that a scirrhus tumor beginning as such, continues thus to the end of its career. After a state of maturity is reached, and softening takes place, medullary masses may appear, as well as fungous shoots, with here and there melanotic intermixtures, and in the event a bone is reached in the progress of the disease, osteoid growths mingle in the complicated mass.

The infiltration of the lymphatic glands with carcinomatous material unfits them for performing their natural functions; hence the fluids they usually convey become exuded and serve to produce œdema in the region affected. It is not uncommon to meet with an immense distension of the arm, which has been caused by obstruction of the axillary glands through the extension of cancer material from a carcinomatous mammary gland: The veins also get occluded, or collapsed through pressure, and thus contribute to the œdematous infiltration. The arm is stiffened from simple distension, but the skin of the thorax gets studded with cancerous tubercles, and contracted through cicatrization, so that the integument constricts the chest, in some instances to a distressing degree, producing the state which has been denominated "hide-bound."

FIG. 43.



Cancer of the breast.

Medullary cancer is a phase of carcinoma which has for its distinctive characteristic a brainy consistence. For the same reason it is called "encephaloid;" and by contrast with the density of scirrhus, it is also distinguished by the term "soft cancer." Fungous hæmatodes is a variety of medullary carcinoma.

The soft variety of cancer almost exclusively appears in young subjects, and is more rapid of growth, and speedier in its fatal issue, than scirrhus.

It produces a greater exhaustion and a more decided constitutional cachexia than hard cancer. Its growth is not by drawin healthy textures to it, as in scirrhus, but taking its supplies fron the blood, the development of the tumor is rapid, the healthy structures being forced aside to make room for the cancer. I infiltrates all the loose spaces in its vicinity, and does not at firs involve and destroy the firmer tissues. The larger blood-vessel become surrounded, yet they resist disorganization for awhile At length, however, all the adjoining structures, vessels included yield to the transforming forces of the disease.

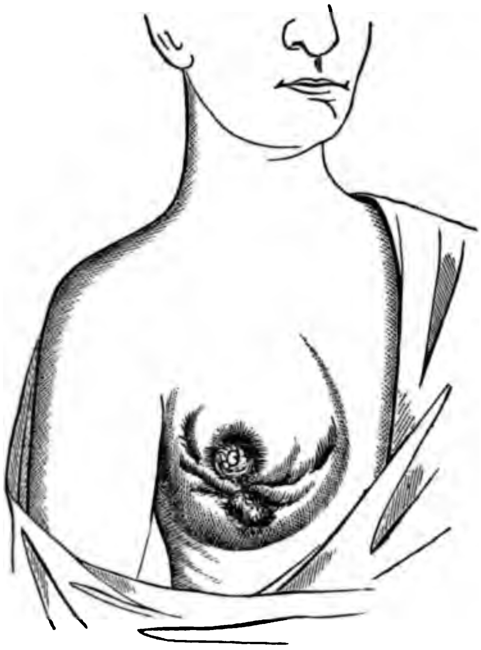
A medullary cancer does not so often attack the female breas as scirrhus, but it may take its origin in any tissue or organ. I forms swellings in the deep structures of the trunk and limbs and gradually approaches the surface. While the disease is thu progressing, there may be little to excite suspicion of the rea nature of the malady, except local tenderness and some enlargement. In the course of time globular projections appear, whic are elastic and seemingly fluctuating, as if a cyst or collection o pus existed. When the swelling is manipulated, the impressio conveyed to the fingers is so deceptive that experienced surgeon have plunged a knife into one of the projections with the expectation of reaching a purulent cavity. The escape of a little venous blood quickly undeceives the operator; and the protrusio of a bleeding fungus from the wound reveals what the diseas would have accomplished in a few days had no incision been made

A peculiar characteristic of medullary carcinoma in its progressive stages is an abundance of new veins or enormousl dilated capillaries, which have thin walls, and course tortuousl along the exterior of the tumor. The presence of enlarged arterial twigs is also manifest, but the veins in size and number fa exceed the arteries. The whole tumor is traversed with enlarge vessels, and when a fungous mass protrudes, it bleeds upon th slightest provocation. In fact, repeated hemorrhages become prominent cause of exhaustion.

While a medullary cancer is deep seated, especially if adjacen to a bone, or in its cancellated structure, pulsation is occasionall detected in the morbid mass, also an aneurismal sound, renderin the diagnosis exceedingly obscure. I once saw the femoral arter tied to cure what was supposed to be a popliteal aneurism, bu which proved to be a medullary carcinoma of the inner condyl of the femur, and of the adjacent structures.

A peculiarity of encephaloid cancer is that when complicated with the periosteum or bone, osseous spicula are often found in the medullary mass at a distance from the original bone. The osseous outgrowth seems to be vegetative in its nature, for the shape, which is well displayed after maceration, resembles coralline, or club-mosses. Although these osseous complications are in connection with true encephaloid material, they have been pronounced bone-cancer, osteo-sarcoma, and proliferating osteomata.

FIG. 44.



Cancer of the breast, which has been attacked with escharotics, but not cured.

Medullary cancer has been known to complete its career in eight weeks; and it frequently proves fatal in six months. In rare instances the disease has continued for three and four years. The soft and fungous mass is readily destroyed with powerful escharotics, yet the reproductive forces are so active it is sometimes impossible to hold the growing tumor in subjection. Excision with the knife or ecraseur is the quickest way to get rid of the fungous growth, though the operation may have to be repeated in a few weeks or months. Amputation has been known to radically remove the disease.

Melanosis has been deemed as possessing some pathological distinctions from medullary carcinoma, but the only distinctive feature apparent is the deposition of a black pigment in the whole or a part of the tumor. The pigment is sometimes in the cancer cells, and often in the inter-cellular and inter-lobular spaces. Cancer of the skin, especially if the disease have its seat or origin in moles, is prone to be blackened; so it is in carcinoma of the eye, probably from the circumstance that the organ naturally produces pigment, and when cancerous the coloring matter is developed to an exaggerated extent.

The *colloid* form of carcinoma is less common than the melanotic, and is also a mere feature of cancerous disease, the jelly-like material which prevails in the tumor being little more than an accidental complication. It has been met in the parotid, mammary, peritoneal, and anal regions; and occasionally the gelatinous product is simply enormous, especially when its origin is in the peritoneum. Alveolar structure has been observed in colloid cancer, but in many instances the jelly-like substance is quite free from cells and connective tissue.

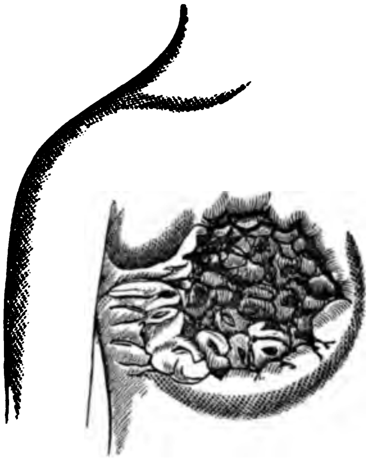
Villous growths in the bladder and urinary canals generally prove fatal; and many of the symptoms attending their development have led some pathologists to regard the disease as malignant, while other observers have not found evidence to warrant the placing of such growths among cancers. A villous growth has fringes like the chorion, though with a coarser mesh-work, and flask-like projections. It grows from a small foot-stalk, and sends out vascular fringes which appear like rootlets floating in a stream. Being extremely vascular, it is decidedly hemorrhagic, especially when injured or disturbed. It has been discovered in conjunction with cancer, but the association may have been accidental.

Treatment of Cancer.—Carcinoma is the most obstinate and insatiable of diseases. When it has once fixed itself in a victim, there is ground for little or no hope. The use of the knife or the employment of escharotics may remove the external sign, yet the systemic contamination remains; and no scheme of medication has often proved efficient in the eradication of the disease.

The time may come when by a lucky hit the agent will be discovered which, when introduced into the circulation, perhaps hypodermically, may antidote the carcinomatous poison; but those who have had the most experience in the treatment of the malady, entertain the least faith in the probability of any such discovery. Every age has had its quota of "cancer curers," and it is likely that in the future there will be no falling off in this respect, for the gullibility of the people will afford traffic for knaves. It is quite natural for those who are sick with an incurable disease to lend willing ears to the assuring promises of those who are more skilled in extortion than in the management of disease.

The most valuable constitutional remedies are those which improve the general health; and there is no doubt but life is prolonged and comfort obtained by the judicious use of medicinal agents. So much benefit is derived from the internal administration of arsenic that for a time the patient is led to believe an ultimate recovery is possible; but the day at length comes when the remedy which excites so much hope, will fail to exalt the vital powers, and the disease then asserts its devitalizing powers, and the end speedily comes. Iodoform has been extolled as exerting a restraining influence over the progress of cancer, but I have not observed any marked effects of a beneficial nature which the agent has produced. An acid solution of iron has done much better, the desirable effects arising chiefly through improvements of the digestive and assimilative functions. Sulphur accomplishes something in the same way; so does phos-

FIG. 45.



Cancer of the breast which has been excised, but not cured.

phorus. The bitter vegetable tonics are valuable inasmuch as they support the constitutional powers by acting favorably upon the stomach. Chlorine has had its supporters, but unless united with acid or iron, very little good may be expected from its use. High hopes were at one time raised by the announcement that cundurango—a South American vegetable—would positively cure cancer, but experience proved the agent to be utterly worthless. The waters of a mineral spring near St. Albans, Vermont, were lauded a few years ago as possessing virtues which would invariably stay the progress of cancer, and cure in the majority of instances, yet little benefit accrued from the use of the agent except that which might arise from any systemic invigorator. Sea voyages, ocean bathing, and almost exclusively a fish diet, have been regarded as valuable auxiliaries in the treatment of cancer, though nothing substantial in the way of relief has thus been gained. It is said that those who drink the arsenical waters of Styria are seldom or never afflicted with cancer; but if such were true the surgeons of Europe ought to be acquainted with the fact, and their writings are silent on the subject.

The local treatment of cancer has an extensive range. Arsenious acid made into a paste with flour and water, or incorporated with any inert powder, will rapidly destroy scirrhus and medullary growths. The following formula has power to devitalize and disintegrate almost any malignant tumor:

℞ Pulv. arsenious acid, ʒj.
Extract of belladonna, ʒij.
Gum opium, ʒj.
Simple cerate, ℥jss. M.

S. Arsenical plaster: Spread a drachm on every square inch of leather needed to cover the surface to be devitalized. If the tumor be covered with integument, the cuticle may first be removed with some vesicating material. The arsenical plaster is then to be applied, and kept in place for two hours; in that time the superficial layer of the cancerous tumor has been deadened; and may afterwards be softened with a poultice, or the undetached slough may be covered with any unirritating cerate. At first no pain is provoked, but while the arsenic is actively devitalizing the cancer-product, the suffering is quite excruciating. The belladonna and opium are incorporated in the plaster to mitigate the pain; but they do not fully accomplish that purpose. No arsenic should be administered by the stomach while the arsenical plaster is employed, for as much of the mineral will be absorbed as can be endured without producing dangerous symptoms of poisoning. The plaster is to be re-applied every day unless a puffy condition of the eyelids and a fullness of the abdomen express a warning which should be heeded. Most patients will endure the daily use of the plaster without manifesting constitutional symptoms of poisoning. The healthy structures surrounding the cancerous slough will be irritated by the arsenic, but not devitalized; and in a few days a loosening or detachment will take place between the tumor and the adjacent structures—pus appearing in the crevice. In fact the cancerous mass has been entirely devitalized, and is a slough which is to be removed by the assistance of forceps or the handle of a scalpel. As the dead lump comes away the irregularities of its exterior show how the malignant tissues had dipped into the inequalities of the healthy surroundings. The suppurating and granulating cavity is to be dressed every day with simple cerate or Mayer's ointment, until the sore has healed. It would be a blessed thing if this was to be the last of the terrible disease, but generally it is not. An enlarged and indurated lymphatic gland in the vicinity may have cancer-cells in it, which will develop a new growth in a few weeks or months; or secondary growths may soon stud the liver, lungs, or other deep seated organ beyond the reach of local treatment.

Chloride of zinc made into a paste with flour and water, or with any inert powder, is an efficient escharotic for the local destruction of cancer. The combination with blood-root, as advised by Dr. Fell, is not important. The zinc and flour may be easily made into a paste, a few drops of water being employed in the mixing process. The action of the zinc paste is rapid, and attended with so much pain that a chloral anodyne should be administered at the time the paste is applied. The escharotic may be kept upon the cancer for an hour each day, until the whole mass is devitalized and converted into a slough which may easily be removed. The dying process in the tumor under the action of zinc, is much like that which arsenic produces. The healthy tissue surrounding the cancer is irritated, but not destroyed. If the tumor be large, the devitalized layers may be incised or cut into occasionally to hasten the penetrating process. The patient is best pleased to see the whole tumor roll out at once, for he thinks that may be the last of the disease. But in this there is likely to be disappointment.

Other escharotics, more or less active, have been employed in the destruction of cancer tumors, yet I can see no advantage in multiplying formulæ, after the best have been mentioned.

Electrolysis has accomplished very satisfactory decompositions of carcinomatous growths, but so many failures attend the use of electricity in expert hands that I can not rank it higher than other means less costly and troublesome.

When a cancerous growth is in a safe place for a cutting operation I prefer excision, or incision with enucleation by the aid of the fingers, to any other method. It is rapid, and attended with little pain if the patient be anæsthetized during the operation. When a scirrhous tumor of the breast is not large, and the skin is not involved, a shallow incision is to be made over the lump, and the fore-finger, inserted in the cut, is to circumscribe the indurated mass or masses, and to detach from surrounding parts what should be removed. The finger will find and remove the morbid structure more effectually than the knife.

If the indurated mass embrace more or less integument, and present a well defined boundary, an elliptical incision, including the diseased skin, should be made, and a considerable portion of the operation performed with the knife and scissors. When the finger is used to enucleate the mass it gathers up bands of fascias and vessels which should be divided with scissors. It is generally deemed best, however, to break lymphatic vessels, for the diseased duct is stronger than that part which is healthy, consequently the rupture will take place beyond the disease. Enlarged lymphatic glands in the vicinity of the tumor should be removed with the finger when found.

It does little good to attack with caustic or knife, an extensively diffused cancerous mass, especially if symptoms indicate a speedy dissolution of the patient, for, though the treatment do no harm, interested and meddlesome parties will declare that the patient's death was hastened by the medication or operation. In the worst cases it is evidently best to seek by gentle means to allay the pain and to so modify the conditions of the disease that a state of existence may be as tolerable as possible. In the Summer season the dressings and sore will become infested with maggots unless great care be exercised in the management of the case.

In regard to the propriety of performing a cutting operation, Mr. Moore, in *Holmes' System of Surgery*, says: "In respect to an innocent growth, the right proceeding is sufficiently plain. If the system be healthy, the tumor growing or inconvenient, and the circumstances of season, air, and place suitable, an innocent tumor may be safely and finally extirpated. But when the tumor is malignant, excision in the very large majority of cases is not a final remedy. The disease returns in the unhealed wound, or in the scar, or in the glands; or, should those parts remain healthy, the internal organs and distant structures of the body become cancerous, and sooner or later, after all, the disease is fatal.

"The hope of temporarily renewing the health and usefulness of the patient is the chief, though not the only, ground for recommending an operation. Regarded by itself, it can not but be esteemed as a very great benefit, and from the point of view of the patient may seem and be of infinite importance. What the duration of that interval may be is commonly too uncertain to be predicted, except in cases which ought not to be operated upon at all. Upon an average of properly selected cases, it may be said to extend to about twenty-four months; the majority of patients being laid up by a recurrence of the disease in the first year, whilst some remain free from it for a considerably longer period.

"The longest intervals which elapse between the time of extirpating a scirrhous breast and the recurrence of the disease occur in cases in which the operation is performed within a few weeks after the discovery of the disease. Ten or twelve, even fifteen years of health have sometimes intervened, when patient and surgeon have both been thus prompt to detect the nature of the tumor and to decide upon its removal. That in all instances equal promptitude has not been so largely rewarded may have been due to the form of the disease, or to the unhealthy circumstances in which the patient happened to be placed subsequently to the operation.

"To assert that in any individual case life is lengthened by the operation is rarely possible, since we are necessarily ignorant of what would have been the duration of life if the disease had been left to run its course; but it may be assumed to be lengthened when the early affect of removing the primary disease is a return of a feeling and an appearance of general health which did not exist before the operation."

Bryant, in his *Practice of Surgery*, says: "Cancerous tumors should be excised when practicable; and the sooner the operation is performed, after the diagnosis is clear, the better. Open cancerous tumors had better, as a rule, be treated by caustics, or by enucleation; the best caustics being those which contain chloride of zinc."

Hamilton, in his *Principles and Practice of Surgery*, says: "Excision continues to occupy the position which it has so long held as the most important, if not the only remedy for this intractable malady. We may at least say, that in a large majority of cases no other remedy is equally deserving a trial.

"Electrolysis, so much vaunted by specialists, in its power to decompose tissues, and to convert them into their original elements, has some title to consideration as a local measure; yet it is equally painful as the knife, more tedious, and more liable to such accidents as erysipelas and pyæmia. Of the claim lately instituted that electrolysis, conjoined with general Faradization, is capable of eliminating the cancer virus from the system, it is proper to say that the claim is not supported by any carefully made and well-attested observations; and when gentlemen occupying the position of educated physicians and surgeons, presume, upon the state of the evidence as it now stands, to say to the contrary, they justly place either their integrity or intelligence under suspicion."

The testimony of Mr. Fergusson, in regard to the propriety of an operation is as follows: "Excision gives the only chance of security—a point on which most parties seem to agree—and I deem it one of the duties of the practitioner to urge the patient to submit to such a proceeding."

Mr. Erichsen, in his *Science and Art of Surgery*, says: "The objections that have been urged against the general propriety of operating in cases of cancer, do not apply so much to the operation itself, but are rather based on the supposition that cancer is originally a constitutional affection, and that the patient is consequently liable to speedily suffer from a return of the disease. This objection, however, equally applies to all other means of local removal; and if carried to its logical conclusion, must necessarily preclude any attempt at removal, by any means, of the local disease."

Billroth, in his *Surgical Pathology and Therapeutics*, incidentally remarks, that "we are only to operate when after careful examination we can hope to remove all of the diseased part; a half-operation, leaving behind portions of the tumor, should never be done." This distinguished surgeon, if he is to attempt removal by any means, prefers an operation with the knife or scissors, and does not incline to the employment of caustics. Dr. Gross is not in favor of excision, except in well-selected cases.

My own experience leads me to the conclusion that the early excision of cancerous masses cures in some instances, and in the aggregate greatly mitigates suffering.

It is sometimes difficult to make the patient and friends understand or appreciate the motive for operating; they are disposed to think that the surgeon entertains a hope of radical cure if he operates, and that an error has been committed if in six months or a year the disease reappears.

I have excised an epithelioma of the under lip which never returned; scirrhous tumors of the breast which have left the patients exempt from any form of the disease for periods of two, three and five years; two excisions of the cervix uteri left the victims over a year with excellent health; and one woman who had extensive carcinoma of the foot underwent amputation of the leg, but the disease attacked the stump in less than three months. I then amputated above the knee, though the lymphatics of the inguinal region were greatly enlarged, and twelve years have now elapsed, during which no sign of the cancerous disease has exhibited itself, and the lady in all respects has enjoyed unusually fine health. In three cases of cancer of the leg I have amputated above the knee, and although a season of excellent health followed, ranging from six months to a year and a half, all eventually died of secondary affections of the viscera.

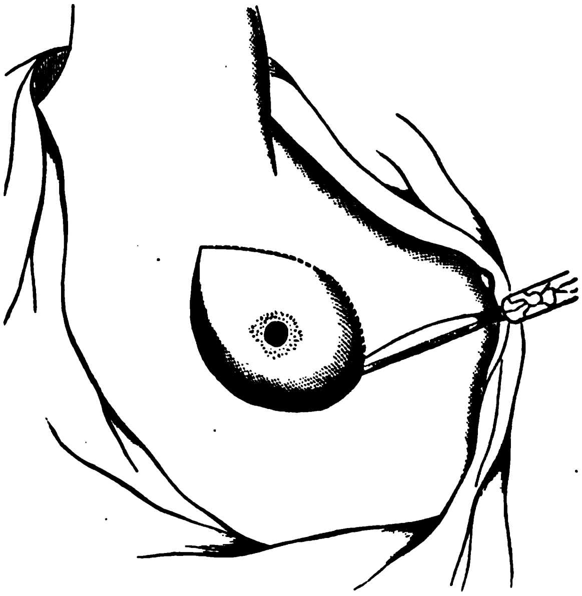
In a case of cancer of the arm I amputated at the shoulder joint; the patient gained flesh rapidly, and became more robust than ever before; at the expiration of fifteen months a troublesome cough came on, the assimilative functions suddenly failed in their activities, and the emaciated sufferer died in six weeks from secondary affection of the lungs.

Somewhat extensive experience with malignant disease of the mammary glands, has led me to be somewhat conservative in regard to operative procedures, though I would seldom hesitate to excise a carcinomatous testicle.

I rarely perform excision or amputation for the removal of a cancerous mass, without following, and sometimes preceding, the operation with vigorous constitutional treatment. Int medicines should be administered for months, and varied time to time to suit the peculiarities of the patient. An oper repeated some months after the first, to remove a re-appea tumor, is rarely advisable, unless the morbid mass is seemi isolated and circumscribed.

A rather deep cancerous or "suspicious" tumor of the m mary gland, not involving the skin, may be enucleated thr an incision of the integument, the fingers and scissors b chiefly employed in the enucleative process. During the op tive procedure the fingers are to find and remove any enla

FIG. 46.



Amputation of the mammary gland.

lymphatic glands or indurated masses, the course to the a being especially examined. Along the inferior border of pectoralis major muscle is a chain of lymphatic vessels w connects and communicates with the axillary group. Whe operation is decided upon, it should be executed in as thor a manner as possible. A timid operator rarely enucl thoroughly. The wound which attends excision or enuclea should have ample drainage; the healing process is gene rapid—perhaps too much so. The amputation of a large pa the mammary gland, for the removal of a cancerous mass, should not be followed by an attempt to close the wound, especially if the skin has to undergo much tension. The wound better be left to heal by granulation.

The amputation of the female breast is easy of execution. After the patient is anæsthetized, the operator makes an elliptical incision on each side of the nipple, near the base of the gland, the general direction of the cuts being so that one end of the ellipsis shall be downwards, to facilitate drainage. After the skin, fat and fascias are incised with a scalpel, the fingers may be used to lift the mass from the pectoral muscles, ribs, and intercostal structures.

Bands of fascia, vessels, and strong tissues, may be divided with scissors. Few if any vessels will need ligating, though there is no serious objection to the ligature in the event that an artery bleeds obstinately.

When the tumor has not reached the skin, yet the retracted nipple shows that the lactiferous ducts are involved, the incisions need not include so much integument as the accompanying diagram represents as being embraced in the operative procedure. It is unsurgical to remove more tissue of any kind than may be seemingly necessary. However, the sharp angles of an ellipsis favor the even approximation of the edges of the wound.

When there is plenty of elastic integument the sides of the wound may be drawn into apposition by the use of silver sutures, yet the structures should not be subjected to much strain lest the tension be unpleasant, and provocative of a return of the disease. Adhesive strips serve to keep the wound from gaping too much. No lotion or unguent is of any special use in treating the traumatic state. After the wound has healed, the region should be kept as free from irritation as possible.

EPITHELIOMA.

Every physician of considerable experience has not been without opportunities of witnessing nodular, scaly, and ulcerative diseases of the face, which, from their obstinate and intractable nature, come under the suspicion of being malignant. The morbid phenomena of the affections under consideration may differ substantially at first, but in the end they acquire a marked resemblance. From the fact that their destructive tendencies are similar, and the treatment required for the arrest of the several varieties of cancroid ulcers does not vary essentially, the several morbid manifestations have been grouped under one heading.

Lupus, (*noli me tangere*).—A species of ulcerative disease, cancerous in nature, though not exhibiting the constitutional contamination of true carcinoma, attacks the integument of the face, and in time extends to the deeper structures. The first sign of morbid action may be in a furfuraceous nodule or a scaly tubercle; in the course of a few months this may exhibit a crack or fissure at its base; and, finally, an active state of ulceration sets in, the destructive process proving positively dangerous. However, there is a variety of lupus which is not inclined to extend itself, consequently two forms of the disease are recognized, the spreading (*excedens*), and the non-spreading (*non-excedens*).

The milder phase of lupus may continue in the form of tubercles or nodules, and never show a disposition to inflame, ulcerate, and destroy. However, it is in the nature of the disease to reach a destructive stage, large surfaces yielding to the disintegrating forces, even cartilages and bones dissolving under the mutilating influences.

A lupous ulcer is frequently concealed by a crust or scab, and its character is not suspected until the covering is purposely or accidentally removed.

Attempts to make the ulcer heal under the influence of "healing salves," and simple ointments, prove abortive. A fresh crust forms, and ulceration goes on beneath it. In some instances the mildest treatment provokes a phagedenic state of ulceration, hence the disease has received the appellation of "touch me not."

A scaly or furfuraceous nodule, with enlarged and tortuous blood vessels at its base, is sometimes called a "wart cancer," though there is nothing truly cancerous about it. The neighboring lymphatic glands remain unaffected, and there is no sign of constitutional contamination. The disease is local in character, but destructive in its tendencies. If the morbid action be not checked the nose may be disfigured and an eye distorted. Death has been known to result from the prolonged irritation and annoying tendencies of the disease. The ichorous and suppurative waste contributes a share to the fatal issue.

Generally, while a lupous ulcer is spreading, the healing process is also going on, so that the surface traveled over by the ulcerative action is partially repaired before the limit of destruction is reached. Although the cicatrose tissue is unsightly, it is preferable to a raw surface.

Sometimes there is a bright redness connected with lupous papules and nodules, and a flush in the adjacent skin. This prominent hue does not indicate a malignant phase of the disease, but rather the contrary of such a state. It has been called the erythematous form of lupus.

The cause of lupoid ulceration is not known. The disease is believed to exhibit an hereditary tendency; and has been declared to be a form of scrofula or eczema. There does not seem to be any substantial reason for considering lupus as a phase of any other disease; and there are peculiarities in the morbid manifestations which render it highly probable that the affection has a distinct and independent source of action.

Although strikingly local in its manifestations, lupus does not always leave the general system unimpressed. Possibly the systemic deterioration is chiefly brought about by mental disturbance created through dread of a cancerous complication and a fatal termination. Certain it is that patients afflicted with lupus are apt to lose flesh, and to suffer from rigors, night sweats, and nervous prostration.

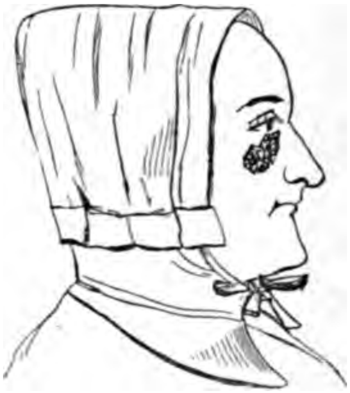
Treatment of Lupus.—The local treatment of a lupous nodule, tubercle or ulcer, should be exceedingly mild and unirritating, or a powerful escharotic. It is sometimes best to wet the morbid surface with saliva several times a day, or with a weak solution of pepsin. I have known a scaly papule on the face to disappear under the sole influence of the patient's own saliva. Ten drops of Fowler's solution in an ounce of neutral glycerine constitute a local application of value in the treatment of the furfuraceous stage of lupus. A pomade of cold cream and Fowler's solution, a few drops of the latter to an ounce of the former, is a favorite with me in the management of the incipient forms of malignant nodules and ulcers. Mayer's ointment is also an excellent dressing.

If the lupous disease be active in its nature or in an advanced stage of ulceration, I recommend an efficient caustic to be applied at once, in order to destroy the destructive virus. A chloride of zinc paste, made by incorporating twenty grains of the salt in a drachm of stiff mucilage, is a reliable escharotic for a small lupous ulcer. One application may be enough to destroy the disintegrating properties of the sore. After the paste has been in contact with the ulcer for a few hours, its escharotic force is spent, and the pain caused by its action subsides. A simple cerate answers for a daily dressing of the burnt surface. The reparative process may be hastened by the internal use of alteratives and tonics. The newly formed scar should be protected by a covering of isinglass plaster.

Turpentine in ten drop doses, repeated every four hours, is thought to favor the healing process of "ill-conditioned" ulcers. I believe iron and mineral acid to be superior to turpentine. Sulphur, phosphorus, and iodoform may be given with reasonable expectations of benefit. Arsenic and cod liver oil are deserving of attention in obstinate cases. The vegetable alteratives, so called, are not efficient. While they may improve the secretory functions, they have little power to increase the reparative forces.

Rodent Ulcer.—There is not a striking difference between rodent, lupous, and cancroid ulcers. The signification of the term is allied to that of lupus—both mean gnawing or destroying. The rodent ulcer attacks old subjects, and seems akin to epithelioma. The sore does not usually begin in a tubercle or nodule, but in a scaly spot, which at length may discharge ichor and form a crust. After remaining indolent for months or years, active ulceration may set in, and soon disfigure a considerable portion of the face. In the spread of the ulcerative action a wing of the nose may melt away, or an eyelid with some portion of the lachrymal apparatus may be destroyed. The disease is malignant in nature, and rarely heals kindly, or submits to mild treatment. If left to take its own course it may do so much mischief as to bring about a fatal issue. Although not essentially or necessarily a constitutional disease, the general system suffers more or less from the prolonged local action. In some cases, there will be exhibited loss of flesh, hectic, and other marked signs of devitalization.

FIG. 47.



A rodent ulcer, like lupus, usually starts in the integument of the face, but sooner or later attacks the deeper structures; and in its spreading career shows an inclination to reach the nasal and ocular apparatus. It may penetrate to the bone, and transform firm structures into granular and liquid *debris*.

The edges of a rodent ulcer are uneven, and slightly raised; they are also ragged, undermined, and inclined to bleed; and they present a redder color than the adjacent integument.

The lymphatics in the vicinity of a rodent ulcer are generally not enlarged; in rare cases they are affected. The enlargement may come from sympathetic irritation or from the absorption of virus generated in the ulcer as a result of decomposition.

Rodent ulcer, like lupus, makes slow progress unless hurt, or provoked to undue activity with injudicious appliances.

Treatment.—The management of rodent ulcer should be much the same as that recommended for lupus. In the earlier phases, when a furfuraceous spot or slight fissure in the skin embraces all there is to be seen, ten drops of Fowler's solution in an ounce of water, constitute a suitable application. But as soon as an active state of ulceration sets in, the treatment must be radical in its nature. Little may be expected from "healing salves," unless it be actual damage. The ulcer must be completely excised, or destroyed with escharotics. Chloride of zinc made into a paste with flour and a few drops of water, is among the best agents for overcoming the local virus which keeps up the ulcerative process. The chloride of zinc converts the ulcer into a healthy sore which heals readily, or may be made to do so with a slightly stimulating and astringent unguent; Mayer's ointment is generally useful as a dressing for healing ulcers.

If the cicatrix be thin and blue, and its edge be indurated and nodular, a recurrence of the ulcerative process is to be feared. The application of pinus canadensis (fluid extract) tends to strengthen the delicate cicatrose tissue.

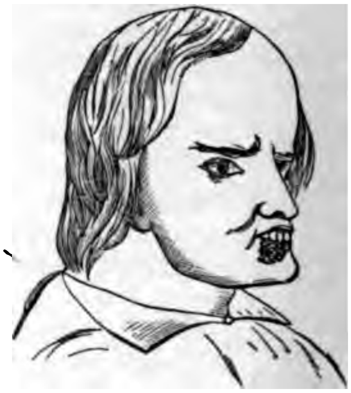
The internal use of iron, mineral acids, bitter tonics and arsenic, should be pushed all through the healing process, and for months afterwards to guard against a return of the ulcerative action.

Cancerous Ulcer, Cancroid, Epithelioma.—A malignant fissure or nodule beginning on the face, genitals, nipples, and other delicate structures, is not uncommon. In the early stages the morbid phases resemble those of lupus and rodent ulcer; but in the later stages the constitutional contamination becomes more marked than in those diseases. The neighboring lymphatics

become implicated, and the patient exhibits perilous anæm
Although the disease makes slow progress at first, or for a f
months, its terribly destructive influence is manifest sooner
later.

The under lip is a common place for a cancerous fissure
nodule to fix itself; and from the fact that pipe smokers ha
the disease oftener than others, it has been inferred that the rough and hot stem of a pipe, pressing as it usually does upon the under lip, serves to fix and develop the malignancy. Some inveterate smokers hold the stem of a clay pipe in a space made vacant by the loss of a tooth; and thus subject a certain spot on the lower lip to prolonged irritation. But, in refutation of the theory that pipe smoking originates cancer of the lip, it may be pertinently asked why the upper labium
never attacked though almost as severely irritated while smoki
as the lower? Besides, not one pipe smoker in a thousand h
cancer of the lip.

FIG. 48.



It seems as if there was a predisposition for cancerous ulcer
attack the lower lip. Then, if a cancerous taint exists in t
blood, and is apparently waiting for localization in order
develop or mature as is its nature, any titillation or prolong
irritation at a particular spot, may contribute to the fixation.
is not probable that the irritation of a pipe stem *originates* canc
it is possible that the irritation of a pipe stem may invite or p
voke a *fixation* of cancer germs which already exist in the flu
or tissues of the body, and which are ready and waiting for
opportunity to locate and develop.

A cancerous ulcer of the integument, which may be called
cancroid or epithelioma, is apt to be hard in its base and borde
the discharge from it is ichorous, and the minute vessels s
rounding it are dilated and tortuous.

A patient with a tegumentary cancer does not suffer in gene
health and appearance until the later stages of the disease ha
been reached. I have frequently met persons with cancroid

he face, who maintained a vigorous condition of the body. They were not of a sallow complexion, nor did they exhibit evidence of devitalization. However, such is not usually the condition of individuals who have a cancerous taint in their blood, especially after the disease is somewhat advanced; but a sallow hue invades the face, anæmia is strikingly apparent, the flesh wastes, night sweats and rigors come on, lassitude and mental depression are a sequence, and signs of approaching dissolution become unmistakable.

The sensations attending the evolution of tegumentary cancer are represented as being of a creeping, pricking, itching, and darting character, and not distressingly painful until the later phases of the disease are reached. The idea of a cancer being a creature is prevalent among the unprofessional, therefore a patient, in conformity with this notion, is apt to describe the sensation attending the disease, as that of biting, crawling or gnawing. Not much reliance can be placed in a description based upon a perverted imagination.

Treatment.—The scaly tubercle, nodule, or papule which may be the earliest manifestation of epithelial cancer, can safely be treated for awhile with simple applications, a course which has been recommended for the early phases of lupus and rodent cancer. To an ounce of unguentum aquæ rosæ (cold cream), may be added ten drops of Fowler's solution and a drachm of pulverized subnitrate of bismuth; and this should be lightly rubbed upon the furfuraceous spot three times a day. The pomade can do no harm; and in some instances I know it has allayed annoying sensations and held the morbid action under restraint.

If an ulcerative state be reached before professional attention is called to the disease, the morbid mass should be excised at once, or attacked with powerful escharotics. If excision be practiced, every particle of diseased tissue should be removed, and the wound dressed with simple cerate or other unirritating ointment; if an escharotic be employed, the agent should be chloride of zinc or arsenical paste. A drachm of chloride of zinc rubbed up with ten grains of pulverized acacia and a few drops of water, makes an efficient compound to be employed in the destruction of an epithelial cancer. A drachm of pulverized arsenious acid incorporated with a half ounce of the extract of taraxacum or other substance of about the same consistence, constitutes an active escharotic to be applied to cancerous structures. If the surface to be attacked be large, a small quantity of the arsenical compound should be used at any one time, lest enough of the poison be absorbed to prove detrimental. A plaster the size of a silver dime would not part with arsenic enough to do any harm. The application may be repeated every day until the indurated structures have been converted into a slough. Granulations will then spring up in the sore, and the reparative action will fill the chasm with healthy tissue. The healing surface may be dressed every day with a simple ointment or an unirritating pomade. Mayer's ointment constitutes one of the most valuable dressing salves.

When the epithelioma attacks the under lip I prefer to excise the diseased mass, embracing it in a wedge-shaped incision; and then closing the gap with silver sutures. This shortens the lip appreciably, yet not to a seriously objectionable extent. The mutilation produced by the use of escharotics is unsightly, especially when the under lip is the seat of disease. The loss of structure allows the saliva to dribble from the mouth, and the under teeth are hideously exposed. Nothing short of an unimportant plastic operation would close the gap or chasm in the lip.

The internal treatment to favor eradication of the cancerous taint consists essentially in arsenic and iron. Two drops of Fowler's solution may be given at a dose four times a day every other day. On the alternate day some favorite preparation of iron should be administered. No other remedies are known to retard the fatal issue of cancer. The diet of patients afflicted with devitalizing diseases should be easy of digestion and nutritious; and the mind should be kept free from worrying influences. Mental anxiety and loss of sleep will deplete the most robust.

SECTION IV.

TUBERCULOSIS.

TUBERCLE is a waste material which does not find its way out of the body, but lodges in the meshes of otherwise healthy tissues, and proves detrimental on account of its unassimilable nature—it is a foreign substance in the organism. The systemic condition which develops tubercle is designated as scrofula or struma, and the morbid state attendant upon the existence of tubercular matter is denominated tuberculosis.

Tubercle is not organizable though the product of vital operations. It is cheese-like in color, friability, and consistence; and sufficiently yielding to take the form of the mould into which it is deposited. In a liquid form it floats in the blood until strained through the sieve-like walls of vessels, and cools and curdles in areolar spaces. Originally it was a constituent of food, and passed through the processes of digestion, but failed to reach that advanced state of digestive elaboration which is necessary for assimilation. Tubercle, then, is the result of faulty digestion, though not necessarily of indigestion, as that term is commonly employed.

Scrofula may be defined as a state of the constitution in which there is a tendency to produce and deposit tubercle in various tissues and organs; and tuberculosis may be considered as the disease which scrofula is inclined to produce, although a scrofulous state may exist without the production of tubercle, or the morbid condition known as tuberculosis. A scrofulous child may reach maturity and never develop tubercle, and at length lose every symptom of the original defect. Scrofula is a disease of early life, and is characterized by a skin so thin and transparent that the veins beneath are seen, by enlarged lymphatic glands, large head, fine hair, lustrous eyelashes, blue or hazel eyes, white and brittle teeth, retreating chin, slender neck, narrow chest, protuberant abdomen, and flabby limbs.

A scrofulous child is quick of apprehension, with a highly impressible nervous endowment; it has a furred tongue, fetid breath, capricious appetite, and irregularly acting bowels. It is liable to eruptions of the skin, chronic inflammation of the eyelids and conjunctivæ, ulcers of the corneæ, suppuration of the cervical lymphatic glands, and to chronic abscesses in various parts of the body.

The scrofulous diathesis is frequently hereditary, though the children of parents who have never manifested a scrofulous sign, have exhibited unmistakable marks of struma. It has been said by critical observers that the marriage of parties having similar physical endowments, is followed by defective offspring, as is the progeny of parents allied by consanguinity. The subject is a subtle one, and cumbered with much fanciful speculation, therefore, I will leave it to those who enjoy the discussion of this and kindred topics, including that of the temperaments. I am inclined to believe that scrofulous children are the descendants of those who were similiarly affected when they were young. People are apt to forget their defects, or are disinclined to admit that a scrofulous taint exists in their blood. Besides, the constitutional or hereditary vice may exist, and never show itself. It may be held in check by wholesome food and favorable sanitary conditions. It is not uncommon to see a child thrive until it is weaned, and its swelling teeth irritate the jaws; then come wasting of flesh, sour state of the stomach, eruptions behind the ears, irregular bowels, offensive discharges, and the whole train of disorders peculiar to strumous children.

Young persons possessing a scrofulous diathesis may escape its serious features by taking exercise in the open air, and living upon eggs, milk, berries, and fresh products of the farm; while confinement in school, overtaxed brains, and improper diet, may develop psoas abscess, strumous arthritis, or phthisis pulmonalis. Tubercular matter, when carefully inspected, appears to be granular, angular, translucent, and glistening; tubercles, when recently deposited, are spheroidal in shape, and the size of millet-seed; but it is not uncommon to find tubercular deposits as large as a hen's egg. Angular forms are not infrequent, especially when the moulds favor angularity; spinous projections are not uncommon, and other irregularity of outline.

It is a peculiarity of tuberculosis that tubercular matter is deposited chiefly in one region, while other parts of the body may continue exempt from invasion. However, scrofulous deposits have been found in the pulmonary tissues, in the mesenteric glands, in the ischio-rectal fossæ, and in the cancellated structures of the bones. In fact, tubercular deposits sometimes are found in every loose tissue of the body. Tubercles have been observed in the skin.

Tubercular matter is homogeneous, and destitute of cells, tissues, vessels and nerves. It has no inherent power of growing, but increases by deposits upon its exterior. When pressed between the fingers it feels greasy; and fatty matter is one of its chief constituents.

Tubercle, when it accumulates in masses, tends to soften, especially in parts remote from vital activity. The center of a large tubercular mass is so far removed from vital influences that metamorphic changes are likely to take place, which may result in a liquefaction of the granular matter and its removal by absorption, or in the development of inflammatory action, and the establishment of purulency.

Tubercular diseases may be arrested for a season by change of climate, and by judicious medication, but as soon as the circumstances favorable to health are withdrawn, a return of the morbid processes may be expected. It is asserted by some writers that tubercle is never metamorphosed and removed, but I am convinced that tubercular matter is frequently carried out of the body through the influence of proper medication and salutary influences. I have known lungs which were unmistakably tuberculosed to become entirely free of foreign matter in the course of two or three years.

Tuberculosis of the lymphatic glands is common in early life, but comparatively rare in old age. Enlargement of the superficial and deep cervical lymphatics in middle life is often a precursor of phthisis. Autopsies of individuals dying of consumption, reveal a tubercular state of the bronchial lymphatic glands; and in a disease denominated tabes mesenterica, the lymphatics of the intestines are enlarged, indurated and tuberculosed. Anal fistula and sinuses about the rectum, are frequently the result of the softening of tubercular matter in the ischio-rectal and coccygeal regions.

The lymphatic glands of the neck often suppurate, and leave puckered cicatrices when they heal; I have often witnessed tubercular lymphatics below the ear and jaw as large as medium sized potatoes. Such tubercular masses will sometimes suppurate, yet as often they pass away without leaving a sign of disordered action. . In some instances they continue for years in a state of inactivity, and then gradually subside until they cease to be noticeable. When such lumps do soften and suppurate, the morbid process is similar to that of a chronic abscess; the pus is thin, turbid, and flaky or curdy; and the discharge is persistent, the healing process being much slower than in an ordinary abscess.

Tubercular deposits occasionally undergo calcareous degeneration, and become harmless. Patients threatened with death from phthisis have entirely recovered through a transformation of tubercle into a cretaceous substance.

The treatment of tuberculosis is chiefly constitutional, very little benefit being expected from local applications. In a few instances I have excised tubercular masses, and obtained excellent results. The topical application of iodine has frequently induced absorption, and as often provoked inflammatory action which terminated in suppuration and cicatricial deformity. Gentle pressure is reported as having caused the subsidence of tuberculosed lymphatics, yet few glands are so situated that the treatment can be successfully put in practice.

What are usually denominated "alteratives" may exert a beneficial influence upon tuberculosis. But a remedy that proves an alterative in the treatment of one patient may prove entirely inert when administered to another. The iodides of potassium and ammonium have the reputation of reducing tuberculosed and enlarged lymphatic glands; and iodoform may next be named as a potent agent of the same class. Nitric acid serves indirectly as an alterative by improving digestion; and arsenic may be named in the same connection. Sulphur has always borne the reputation of being useful in the eradication of scrofula; but it has to be given at intervals for months and even years, before great success is attained. There is little use of attempting to manage tuberculosis successfully unless attention is paid to digestion and assimilation. Cod liver oil may be a good alterative and favor assimilation, but its purposes are often defeated by the disturbance it creates in the stomach. The tasteless syrup of iodide of iron is an agent which can be employed to advantage in some cases of tuberculosis. Certain mineral spring waters have proved invaluable in the treatment of scrofulous and tuberculous patients. The salts produced by the evaporation of the waters of Crab Orchard Springs, in Kentucky, possess properties which have been prescribed to scrofulous and dyspeptic patients, with marked beneficial effects. I commonly mix the salts with sulphur and some stomachic. When constipation is an attendant of tuberculosis the value. of the above compound is decided. Phosphorus is to be regarded as a remedy too important to be neglected in the management of tedious cases of tuberculosis. The vegetable alteratives, as stillingia, sarsaparilla, and the popular compounds of these agents when made into syrups, have had unbounded praises lavished upon them by botanics, and those who are prejudiced against the use of mineral agencies, yet the alterative action derived from such combinations is very weak unless the iodide of potassium be added to the mixtures; and it seems to me that if the iodide be the efficient agent, it may be employed in a vehicle less objectionable than the syrups of stillingia and sarsaparilla. Peppermint water is more agreeable to the stomach than a nauseous syrup; and when the iodide of potassium is dissolved in it, and thus administered in cases of tuberculosis, the effects are more decided than those which follow the use of the salt in combination with the compound syrup of stillingia.

The employment of remedies of a certain kind for a few days, and then replacing them with different agents for a season, is followed by better results than a prolonged course of medication without change of agencies. For instance, iodoform may be given one day and phosphorus the next, and the course changed in a week for Fowler's solution and nitric acid, or sulphur, the medicines being administered on alternate days for the second week. The iodide of potassium or ammonium, and the crab orchard salt mixture, may constitute a third course, to last a week, when a return to the two first mentioned agents will be in order, and so on, in regular and systematic rotation. The plan impresses the patient as scientific, and sustains an interest for weeks which otherwise might flag in as many days.

The diet of patients suffering from tuberculosis should be nutritious and easily digested. If a certain article of food disturbs the stomach, ferments, and is thrown up, it is to be abandoned. Slices of fat from boiled ham can often be eaten with bread, as a sandwich, when other meats are rejected. Pickled pork boiled with chicken, is very tender and succulent. Stewed oysters, well seasoned, are nutritious and stimulating. Broiled quail, snipe, and young partridges, are excellent meats for those who suffer from indigestion and non-assimilation. Venison and lamb are superior to beef as nutritious agents, although the latter when tender, and quickly and lightly broiled, is easily digested and highly nutritious. Milk and cream may generally be used in large quantities. Soups are commonly excellent, especially if taken hot. Alcoholic stimulants rarely do any permanent good. Ale and beer do better, though few are benefited by them. A tablespoonful of whisky and water at night promotes sleep, and thus may improve the patient's condition.

Night sweats are to be checked with sage tea, and if this fails, with mineral acids. Chills and rigors are commonly suppressed by the use of Fowler's solution for a few days. Quinia is rarely indicated, though the occasional resort to it can do no harm, and may assist in arresting periodic or paroxysmal conditions.

When a scrofulous state manifests itself in the eye, as keratitis, conjunctivitis, or iritis, it should receive careful attention, lest the visual powers become permanently impaired. The local manifestation is to be discreetly managed, but not to the neglect of systemic medication. For special directions, see author's *Manual of Eye Surgery.*

SECTION V.

VENEREAL DISEASES.

GONORRHŒA.

GONORRHŒA, in its etymological signification—from a misconception of its pathological characteristics—denotes an inordinate flow of semen, but by time honored and professional usage, the term is confined to a specific urethritis, which passes in vulgar language as the clap. Attempts have been made to introduce a new term, which exactly or more clearly represents the disease under consideration. As a result, the rather heavy word *blennorrhagia* has been coined and has got into reputable use, yet it fails to receive the familiar endorsement among medical writers, teachers and practitioners, which the original name has attained.

The origin of gonorrhœa has always been, and ever will be involved in mystery. Efforts to find out the precise time of its first appearance, have been as fruitless as searches after the philosopher's stone. It is generally believed among medical men, that many diseases arise from time to time, *de novo,* and after spreading rapidly under influences favorable to their dissemination, are at length checked or entirely overcome by the interposition of hygienic means, or a combination of circumstances opposed to the spread and continuance of the morbid forces. It would not, therefore, be contrary to prevailing ideas in regard to other diseases, to suppose that gonorrhœa, if banished from the earth by stringent measures, would, under a lax state of moral and statutory law, again enter the list of human ills and be identical with the original complaint. The causes operating to produce the disease in the first instance, may reproduce it in another if the attendant circumstances be favorable to the reproduction, though no connection exist between the cases

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[illegible] and not suffered to prostitute themselves,

for fear the youth who converse with 'em should catch their distempers."

Mr Beckett, who has examined the old English records in regard to the regulation of stews, makes the following extract which refers to a rule bearing date as early as 1162, and reads: "No stew-holder shall keep any woman that hath the perilous infirmity of burning." It appears that this brenning or burning had existed at a much earlier period, as these regulations were only a renewal of such as had been before established, or had been in operation "time out of mind."

The above quotations, though fragmentary and disconnected, prove quite conclusively that gonorrhœa has prevailed among civilized nations for hundreds and even thousands of years. And there is no positive evidence that the disease, since its origin, has ever ceased to afflict the human race.

Gonorrhœa, in most instances, is confessedly the result of impure contact; an individual having the disease imparts it to as many as have sexual intercourse with the person. Exceptions to this rule exist, and these should be considered. Gonorrhœal pus being highly contagious, needs only to be conveyed to the mucous surfaces of the genito-urinary organs of a healthy subject to have the poison communicated. A cloth which has been recently employed in washing or wiping the affected parts, may convey the virus to another person of either sex using the same upon impressible regions. It is possible that one party suffering from clap may leave upon a privy seat enough gonorrhœal pus to poison a second party who may occupy the same place within a few minutes, or while the virus is fresh and infectious. The presumption is, however, that accidents of this kind are rare—much rarer than are the claims for such a manner of transmission.

A question of great importance, though one not easily settled, is, whether gonorrhœa may or may not arise from other causes than specific contagion? Whether the pus from a simple urethritis may, under any circumstances, excite in another individual exposed to it, a true gonorrhœal inflammation? It has already been intimated that, if the disease were banished from the world, it would soon make its appearance again, arising *de novo* from a combination of influences favorable to its origin. Experiments performed by acute and ingenious observers favor such an idea, if they do not actually prove the point. Ophthalmia may be produced by the inoculation of pus from any source, and it has been asserted that gonorrhœa may be induced by the introduction to the urethra of pus taken from the eye of an ophthalmic patient. While it is unquestionable that a violent conjunctivitis may be excited by the application of gonorrhœal pus to the eye, it is quite improbable that the poisonous properties of an infantile or catarrhal ophthalmia, will, when applied to the genital organs, excite a true gonorrhœal inflammation. Ophthalmia is often highly contagious, and the disease most frefrequently attacks those who are ignorant and careless of consequences, hence in parts of the country where ophthalmic diseases prevail, the transfer of the ocular virus to the genitals, would be a common occurrence, if gonorrhœa could come from that source.

It is not uncommon for a man who has had intercourse with a woman having simple vaginitis, or while she is menstruating, to complain of itching, irritation, and even inflammation of the prepuce, glans, and urethra; and a thorough examination might fail to discover the true nature of the difficulty. The man may think he has taken gonorrhœa, become jealous, and pay a physician for curing his imaginary clap; but these misapprehensions will not alter the real state of the case. A chaste wife who has ordinary vaginal and uterine difficulties, never imparts gonorrhœa to her husband. A woman must have the gonorrhœal virus about her, or be innocent of communicating the disease by sexual intercourse.

Little girls who are affected with worms and disorders of the alimentary canal, occasionally have a muco-purulent discharge from the genitalia, which may lead a parent unacqnainted with such derangements to suspect an outrage had been committed by some scoundrel affected with a vile distemper. The physician, after due inquiry into the real state of the case, is the proper person to allay a groundless suspicion by explaining the cause of the discharge. A simple vaginitis, like a non-contagious urethritis in the male, requires about the same treatment as gonorrhœa; but the cure is more easily effected than when the disease is of a specific character.

After an impure sexual contact, there usually intervenes a period of three or four days before any appreciable signs of gonorrhœa manifest themselves. This is called the period of *incubation* or *latency* of the disease; yet there is undoubtedly a steady progress in the development of the malady, from the inception of the virus to the time the marked signs of the complaint are too prominent to be mistaken.

Some men, though frequently exposed, are almost proof against taking gonorrhœa, while others never escape if subjected to its influence. Those who have been circumcised for a religious rite, or who have had the prepuce sacrificed for surgical reasons, are not so susceptible as those having long and narrow foreskins to entangle and retain the virus. The fact that an individual has had the disease once offers no protection against subsequent attacks, though the first invasion is commonly the most severe to endure.

Gonorrhœa is a distinct disease from all forms of syphilis, yet both may be taken at the same time from an individual having the two kinds of ailments; and the one disorder does not necessarily aggravate or modify the other. Both complaints existing in the same person may be treated simultaneously, each in its own way. Gonorrhœal inflammation is a local disorder, confining its onsets mostly to the mucous surfaces of the genito-urinary organs. In the male, the disease affects the urethra, the glans penis, and the lining of the prepuce; in the female, the urethra often escapes, and the violence of the inflammation is confined to the vulva and the vagina—a fact which seems to show that the disorder is more a genital than a urinary difficulty. The virus may accidentally or purposely be transferred to the eye, where it will excite the most violent conjunctivitis, resulting in a loss of vision in a few hours. The nose and anus have been known to become severely inflamed from gonorrhœal inoculation. The shock of this disease may excite general febrile symptoms, disturbing many of the bodily functions, but the action upon remote parts is indirect, as a severe local injury causes general derangement of the vital powers. The metastatic transfer of the inflammatory action to the testis and knee, is to be referred to the nervous shock, or a sympathetic revulsion, which is analogous to the change not unfrequently observed to take place in mumps, when the morbid action leaves the parotid region, and attacks the testicles or mammary glands. Much has been said by Acton, and other writers upon venereal diseases, about gonorrhœal rheumatism, but it is a question whether a well treated and uncomplicated clap originates a rheumatic condition of the body. Where a diathesis or predisposition to the disorder already exists, it may not be unreasonable to suppose that such a severely disturbing influence as gonorrhœa might serve to arouse and aggravate the difficulty.

At the expiration of three or four days after a suspicious intercourse, an itching and tickling sensation at the meatus, and along the course of the urethra attracts attention. Almost at the same time the lips of the urethral orifice exhibit turgescence, and are glued together with a viscid colorless secretion; this moisture gradually augments and acquires a consistence which leaves a stiffened stain, when dried upon the linen. In the course of twenty-four hours after the initiatory signs, a drop of opaque fluid can be squeezed from the meatus, and slight smarting attends the voiding of urine. Inflammation in the incipient form, though confined to the fossa navicularis, may now be regarded as having begun. From this time forward, for a period of several days, the inflammatory symptoms increase in violence; the slight smarting, experienced at first, becomes a severe scalding, and the discharge grows abundant, and changes from a glairy transparent fluid to a thick yellow pus, which occasionally takes a greenish hue. The urethra, as the finger is passed along the under side of the penis, appears like a hardened cord, and is keenly sensitive and painful. The glans gets red and tender, and the prepuce inflamed and irritated. An uneasy heaviness is felt in the back and loins; the roots of the penis, the bulb, and the entire perineum become turgid, and distressingly disturbed by erections and urinary ejaculations. The sense of tension and weight in the pubic region is severe, yet the vivid burning and smarting during micturition are complained of most. If the inflammation run extraordinarily high, the urine, when passed, flows in a diminished stream, and some blood (probably the result of ruptured capillaries,) is seen. The nervous shock, anxiety and distress, not unfrequently bring on feverish symptoms, so that the local disorder, through sympathy, disturbs the entire organism. In the female the disease is less violent and distressing, owing in part to the fact that the caliber of the vagina is ample to discharge the muco-purulent secretions, and that the urethra rarely participates in the acute inflammatory action.

After the symptoms already enumerated have reached their acme of violence—a state which is ordinarily attained in the course of a week from the appearance of the earliest phenomena—the disease, whether treated or not, begins to subside; the discharge diminishes in quantity, and changes in quality, becoming thin and pale; and the act of voiding urine is borne without much suffering. The decline in the discharge, the burning, and the morbid erections, may lead the patient to hope that he is soon to be rid of the disgusting and truly grievous malady, yet the history of the disease warrants no such conclusions. The stage of subsidence is more prolonged than the stage of invasion. The slightest excess or exposure will bring back the violent symptoms, and sometimes with renewed energy, causing the sufferer to despair of ever getting clear of the treacherous disease. A gleet, at first a continuous flow, and afterwards seen as a drop pressed from the meatus in the morning, lasts for weeks and months. The annoyance of being frequently necessitated to void urine eventually abates, though it will be a long time before a whole night can be passed without an imperious call to wake and obey the command.

Gonorrhœa attains a high state of inflammatory excitement, yet it is rarely attended with any serious lesions; the intensity of the morbid action being confined mostly to the urethra and the adjacent parts, that canal is deprived of its suppleness and elasticity, so that it can not accommodate itself to the range of dimensions the penis assumes from a state of flaccidity to one of vigorous erection, therefore a turgid condition of the organ, putting, as it does, the urethra upon the stretch, is attended with excessive pain. When erection takes place, the penis, instead of presenting a slight curvature upwards and backwards, is compelled to curve downwards by the tumefied and inextensible state of the urethra and surrounding corpus spongiosum. The tense and hardened urethral canal is like a cord which subtends a bow, and pulls the engorged penis downwards and backwards, bending it towards the perineum, giving the organ that peculiar incurvation, known as *chordee*. As soon as the patient is warm in bed, the sensitive, excitable, and irritable penis has blood invited into it, and a painful erection forbids sleep, or wakens the sleeper when he feels the strongest aversion to being aroused. Continued slumber is impossible, for the tendency to erection is not allayed except by a dash of cold water, and then the relief is only transient, for as soon as the state of unconscious repose is reached a fresh erection imperatively calls for relief. The keenly cutting distress caused by these morbid involuntary erections is depicted as the most vivid in the history of diseased action. Not unfrequently the tension upon the urethra is so great that laceration takes place, which is attended with hemorrhage. Occasionally the patient in a fit of rage will "break the cord," an operation which is no more nor less than a forcible rupture of the swollen and unyielding walls of the canal. The hemorrhage under such circumstances is sometimes frightful, calling for surgical interference. The rupture of the urethra generally relieves the chordee, and temporarily lessens the discharge and inflammatory symptoms, yet the spot where the laceration occurred is liable to degenerate into a stricture.

Every patient afflicted with gonorrhœa does not suffer from the pains of chordee. The inflammation may not extend deeper than the mucous membrane of the urethra, and all contingent and adjacent parts will escape. Even in mild cases the inguinal glands may be swollen and tender for a few days, though being only sympathetically enlarged, they rarely suppurate or remain obstinately inflamed.

Cystitis is one of the most serious complications of gonorrhœa. The bladder is not primarily or necessarily impressed, but the inflammation extends, by continuity of structure, from the urethra to that viscus; nor does the morbid action always stop even here, for it may extend through the ureters to the kidneys, and produce nephritis. The most annoying concomitant in this series of complications, is extreme irritability of the neck of the bladder. There will be a frequent desire to urinate, and when the call is felt there is no putting it off. The detrusor muscles act almost in a spasm, and the cessation of the micturition is accompanied with a burning or stinging sensation not easy to endure.

Epididymitis is a somewhat rare attendant of gonorrhœa in its middle or later stages. This is generally supposed to arise from the use of astringent or irritating injections, though orchitis, or acutely swelled testicle, sometimes comes on when no medication has been employed. Whether the inflammation extends by continuity of structure along the seminal passages, or is the result of nervous shocks, impressions, or metastatic symptoms, can not be fully determined. It has been observed that only one testicle becomes involved in the complication, though there appears no reason why both glands should not be involved at the same time, if they be reached by the route of the seminal ducts.

A swelled and œdematous prepuce frequently follows an attack of gonorrhœa, and causes no little alarm in the mind of the patient. Probably an irritating poison of any kind will produce a similar state of the foreskin. The poison of ivy will certainly bring on œdematous swelling of delicate structures, such as the prepuce and eyelid.

Gonorrhœa is never attended with a specific *eruption* upon the skin. In those instanees where there have been cutaneous manifestations, the effect should be ascribed to the use of copaiba or other agents employed in the treatment of the disease—the proof being that patients who abstain from the balsams and terebinthinates, or who rely upon injections only, never are affected with eruptions.

Stricture is a common sequence of gonorrhœa. As the inflammation subsides it is apt to leave a tender, spongy, vascular ring in the mucous membrane and walls of the urethra, at a point where the penis in a flaccid state doubles upon itself in hanging down. Sometimes the constriction, or tumefied spot, is in the bulbous portion of the urethral canal; when the penis is erect, the sensitive knot or swelling can be felt by pressing the finger along the course of the organ through the perineum. The constriction being soft and dilatable is not necessarily an obstacle to the flow of a full stream of urine, yet the irritable spot keeps up a muco-purulent secretion, and impairs erections, and the normal ejaculatory force needed in the emission of semen and the closing efforts at urination. The stream is usually forked or distorted, and if the linen be examined a few minutes after, a wet spot will be found, which comes from the leaking or dribbling of a few drops of urine that had been retained for a time in the dilated pouch behind the stricture.

The lingering discharge which continues after the acute stages of gonorrhœa have passed, has been styled "*the gleet*." The muco-purulent fluid, which constitutes the gleety effusion, stains the linen, and imparts a disagreeable odor to the clothing in the region of the genitals. In some instances the secretion depends upon chronic irritation of the mucous lining of the urethra, and in others upon soft or spongy strictures. The slightest excess, whether it be from coitus, lascivious dreams, drink, late suppers, exhaustive exercises, etc., is always attended with an increase of the discharge. A small drop squeezed into the meatus occasionally, or appearing there in the morning, has been called "pinhead gleet," but it is not different from the ordinary form of the difficulty, except, perhaps, it indicates the approaching termination of the disorder.

It has always been a question whether a gleet continuing for months ever loses the infectious properties of the preceding gonorrhœa. Accidents of a serious nature, involving domestic happiness, are reported as having occurred from the patient being assured by his medical attendant that a man having the gleet could not, by sexual intercouse, impart gonorrhœa to a female. It is even asserted that a fresh onset of gleet, brought back by excess or imprudence after the discharge had ceased for weeks, may possess the virulent properties of the original disease. It is more likely, however, that in most of the unfortunate instances of this kind, the patient has renewed and prolonged the infectious qualities of his gleet by a fresh exposure to gonorrhœa. Generally, a clap loses its contagious properties in eight or ten weeks from its commencement, even if a profuse mucous discharge be kept up. In rare instances, the infectious quality is lost in three or four weeks from the inception of the disease, and occasionally is kept along for as many months.

Treatment.—Before recommending a course or plan of treatment for the cure of gonorrhœa, it may not be deemed amiss to introduce a few remarks concerning what has been called the "abortive treatment" of the disease. Any means employed directly after an impure coitus, such as chlorinated washes, to remove or antidote the virus, are to be regarded as prophylactic; but if several days are allowed to elapse before attention be directed to means designed to counteract the full development of the malady, or until the earliest symptoms of the disease appear, and then treatment be adopted for the purpose of arresting the disease before it can become fully established, the term "abortive" has been used to express the scheme.

It is claimed by writers, high in authority, that the injection of a solution of nitrate of silver into the urethra, just before the discharge has become purulent, and before pain is felt in passing water, will create a *substitutive* inflammation, which arrests the progress of the gonorrhœal disease. If the "substitution" be practicable, the question arises, what strength of solution is most effectual in bringing about the desired result? Debeney advised highly caustic injections—ten to thirty grains of nitrate of silver to an ounce of water—and Ricord formerly recommended a similar treatment, though he at length abandoned such harsh measures. Dr. Wallace, of Dublin, and Dr. Bumstead, advocate a *weak* solution, often employed, to accomplish the same purpose.

Cullerier, in his *Atlas of Venereal Diseases*, is opposed to the plan altogether.

It is universally admitted that caustic injections are extremely dangerous—often causing violent distress, and laying the foundation for the most serious complications, as orchitis, cystitis, prostatitis, and stricture. A lotion, with five grains *argent. nitratis* to an ounce of water, injected into the urethra, has produced dangerous shock, syncope, and hemorrhage; and experiments with solutions of mineral salts of all grades of strength for the abortive treatment of gonorrhœa, have resulted in more failures than successes.

Considering the severity of gonorrhœa, its disgusting nature, duration, and complications, any and every *justifiable* attempt should be made to arrest the disease in its incipiency; yet, when it is considered how few cases are presented for treatment until it is too late for a trial of the "abortive plan," and how distressing, perilous, and unsatisfactory the results, there remains little to be urged in favor of the scheme.

The first and best thing to be done when a case of gonorrhœa presents for treatment during its early stages, is to prescribe a purgative. Constipation favors congestion of the genital organs, therefore a loaded state of the alimentary canal is sure to aggravate gonorrhœal symptoms, and to oppose the curative effect of remedies directed to the genito-urinary apparatus. A repetition of the cathartic or laxative medicine is called for every day or two, while the specific character of the disease continues. It is well to prescribe the following:

℞ Pulv. sulph. magnesia, ℥ii.
Pulv. cubebs, ʒi. M.
Dose, teaspoonful, in water, three or four times a day.

During the early or highly inflammatory stages of gonorrhœa, the violent symptoms are best assuaged by the frequent use of water injections. Warm water may be most agreeable, yet cold water will soonest allay active inflammation. If the patient is likely to underestimate or question the value of so simple a wash, the prejudice may be thwarted by the addition of a few drops of any unobjectionable coloring material. After three or four days from the commencement of the water lotion, or as soon as the violence of the inflammatory action has culminated, or begins to subside, the use of astringent washes to arrest the profuse purulent discharge, is admissible. A grain of nitrate of silver, sulphate of zinc, or other ordinary mineral salt, to an ounce of water, makes an injection strong enough for almost any case, and in many instances, too strong. In the earlier stages of the disease, the milder and more soothing the injections, the less trouble will be encountered in the later periods. Inexperienced practitioners are exceedingly prone to employ powerfully astringent washes at a time when such are not indicated.

The prevalence of a vulgar notion, that clap can be cured in a few days, renders a patient more unreasonable and importunate in his demands for heroic treatment and immediate relief. However, no physician disabused of the idea that the "specific" inflammation of gonorrhœa demands different therapeutics from a simple urethritis, will pay much attention to the popular errors of his patron, or follow the same routine course through the varying phases of the disease.

The manipulation of the penis syringe is of no insignificant importance. A glass instrument in good working order, will do, though a vulcanized rubber syringe is better. After the instrument is charged with the lotion to be employed, its nozzle should be inserted the whole length, and, while the lips of the urethra are pressed with the thumb and fore-finger of the left hand, the piston is made to plunge with the fingers of the right hand. The wash, after being made to extend the whole length of the urethra, should be retained for a minute or two.

The scalding experienced in passing the urine will subside in a few days, even if no medication be employed to allay it. The frequent injection of starch mucilage, or almond oil, shields the irrritated surfaces, and alleviates the burning and smarting. A solution of starch and laudanum is excellent to allay the pain whether injected into the urethra or rectum.

It having been observed that irritation from almost any cause, extending along the urinary tracks, is likely to pervert a neutral into an acid urine, some authors have asserted that alkaline remedies alone, are fit to be employed in the treatment of urethritis. The nitrate of potash in five grain doses, four times a day, has been recommended by the advocates of alkaline medication. It is found, by experience, that ordinary diuretics, which increase the urinary flow, without augmenting the excretion of the salts and solid materials of the urine, prove advantageous in subduing the *ardor urinæ*. The application of cataplasms and fomentations, as hot as can be borne, to the genitals and surrounding parts, may be essential in cases where the inflammatory action runs excessively high. Patients, however, are generally opposed to any treatment or restrictions likely to disclose the nature of their malady.

It has been almost a universal custom among physicians to prescribe terebinthinates and balsams, usually in the form of emulsions, for the cure of gonorrhœa in all its stages. Indeed, copaiba has been regarded a "specific" in the treatment of the disease—as indispensable as quinia in miasmatic chills. It has been argued that the balsam, after passing through the kidneys, leaves a shielding or protecting pellicle along the sensitive urinary passages, protecting them from the influence of the acrid discharges. The objections to these agents are: That they scent the breath with their particular odors; they commonly disturb the digestive system—producing burning sensations in the stomach, and disagreeable eructations; and copaiba not unfrequently sends out an unsightly and unpleasant eruption upon the skin. Being of a highly stimulating character, they are obviously not admissible, until the culmination and decline of the inflammatory symptoms. The late Professor Chapman, of Philadelphia, was accustomed to prescribe copaiba in the earliest stages of the disease, and to declare that the common objection raised against the remedy on account of its stimulating qualities, was not sustained by actual experiment. The agent may be administered in gum capsules, or after being rubbed into an emulsion with acacia, white sugar, nitre, camphor, etc.

A favorite remedy of M. Diday, combines copaiba, cubebs, and jalap; the latter being added for its cathartic powers:

℞ Copaibæ, ℥iii.
Cubeb. pulv., ʒivss.
Jalap, grs. xlv. M.
et fiat electuarium.—To be taken in drachm doses, twice a day.

A combination of agents in a powdered form may sometimes be desirable; especially when the patient has been in the hands of several physicians, from one and another of whom he has had prescribed capsules, emulsions, electuaries, etc., and a change of form is desirable:

℞ Pulv. cubeb.,
Pulv. hydrastis, aa. ℥ss.
Pulv. magnesiæ sulph., ℥i. M.
Dose, a teaspoonful three times a day, in water.

Any of the foregoing preparations will, if the patient co-operate in all well-directed therapeutic and hygienic measures, secure speedy and desirable results; but if he becomes impatient, fretful and reckless, in regard to business, pleasure, or excesses, the favorable influence of the medicines will be thwarted, and serious relapses may be expected. Even a lascivious dream is enough to bring back a discharge and scalding, which had almost ceased through the effect of judicious medication.

The use of hyosciamus, digitalis, gelseminum, and other remedies of that class, has been advocated by writers and teachers of experience. These remedies really exert a beneficial influence over febrile and inflammatory excitement; yet, they produce no marked impression upon the genito-urinary apparatus in health or disease. Lupulin has been prescribed on account of its reputed anaphrodisiac qualities, and so has the bromide of potash, camphor, and belladonna.

If the affection be purely local, as the majority of pathologists are inclined to believe, topical remedies should take the lead in medication. But, as practitioners have cured the disease with constitutional remedies alone, it would be difficult to convince them that internal medicines were not useful. The quickest cures generally are obtained from the employment of both classes of means at the same time; and patients are apt to be best suited with the combined course. A great variety of lotions have been in favor, and there is no end to the combinations that may be formed out of the agents in reputable use. A favorite prescription, mingling mineral and vegetable astringents and an opiate, from Ricord, is here given:

℞ Zinci sulphatis,
Plumbi acetatis, aa. gr. xv.
Tinct. catechu,
Tinct. opii, aa. fʒi.
Aquæ rosarum, f℥vi. M.
S. Injection to be used several times a day.

Experiment has proved that a simple solution of sulphate of zinc, or of the acetate of lead, will accomplish as much as a combination of agents. A weak solution of nitrate of silver has probably been more employed than other lotions. It has the disadvantage, however, of permanently staining the linen. If this agent be selected for topical use, the patient should be told to wear next the skin a short apron, which may be tied above the hips, and extend below the genitals. This cloth, representing the original patch of fig leaves, also protects the shirt and bed-linen from purulent stains. In place of this apron, the penis may be placed in a sheath, not unlike a finger stall, to hide the evidence of the disease from the laundress. The use of a suspensory bandage to support the scrotum and its contents, relieves the sense of heaviness, and may prove a safeguard against orchitis.

The real utility of mucilaginous diuretics, as mallows, flax-seed, etc., has, undoubtedly, been over-rated. The mucilages of such agents are digested, leaving the watery portions alone to pass off through the kidneys. As mere *diluents,* they increase the quantity of urine; but no mucilage, *as such,* enters the blood, and then escapes with the urinary excretion.

Chordee being one of the most severe and aggravating of gonorrhœal complications, calls for special treatment. A camphor and opium pill taken upon going to bed, will do something towards restraining the involuntary erections. An opiate, either as a suppository introduced into the rectum, or as an enema, tends to curb the nervous and vascular excitement of the region, incidentally restraining priapism. Abstinence from food and stimulating drinks for several hours before retiring; sleeping on a hard bed with light coverings; and resting on the side or front of the body, also exert a preventive influence. A basin of cold water kept by the bedside, in which the patient can wet a towel, or large sponge, to be applied to the genitals every time he is awakened by a painful erection, will enable the sufferer to obtain a comfortable night's rest.

Chronic chordee, caused by induration of plastic lymph exuded into the reticular structure surrounding the urethra, will gradually pass away, as all inflammatory action subsides. Inunction probably does little towards exciting the absorbents, or abating the difficulty, but it may serve to divert the patient's mind while the normal process of absorption is going on. Camphor and lupulin may be taken upon going to bed.

Hemorrhage from the urethra, caused by rupture of the mucous membrane, and deeper structures of that canal, during violent erection, is to be arrested by the application of cold cloths to the perineum, and by compression. The fingers applied to the under surface of the penis deep in the perineum, will generally suffice to arrest the flow of blood. A compress may be secured to the region by the turns of a roller around the loins and thighs. Although a hemorrhage from the penis alarms the patient, the results are rarely serious.

Œdema, or a puffy swelling of the prepuce, which is apt to frighten a patient, will generally pass away in a few days, even if the difficulty receive no particular attention. If the swelling come from serous infiltration, a few punctures, repeated, if necessary, will afford relief. The hanging state of the organ favors swelling and œdematous infiltrations, therefore, it is well to direct that the penis be held against the hypogastrium by the agency of a bandage around the hips and over the swollen organ.

Cystitis is a complication of gonorrhœa, and too distressing to be passed without special attention. If there be much heat about the pelvic viscera, cold cloths or ice bags to the perineum and hypogastrium, will prove serviceable. If the patient be chilly, and the pain seem to be neuralgic, or the result of spasmodic action, the use of hot salt bags or hot fomentations will answer better. An opium pill, oiled and pressed within the sphincter ani, often acts like a charm as soon as the anodyne effect is imparted to the irritated nerves of the region. An opiate injection may do as well. If the call to urinate be very frequent, and the distress attending the starting and stopping of the water be severely acute, chlorodyne in twenty drop doses should be administered every few minutes, until the worst of the agony subsides. Afterwards, the tincture of Indian hemp may be given while the difficulty lasts. An infusion of buchu leaves does well in moderate cases. Sweet spirits of nitre make a favorable impression when the irritability of the bladder is kept up by scanty and acrid urine. Sulphate of magnesia taken in five or six grain doses relieves irritability of the bladder.

Gleet, depending, as it generally does, upon chronic irritation of the mucous membrane of the urethra, or soft stricture, is to be treated according to the conception of its cause. Internal remedies need not be employed, unless to satisfy the patient that much is being done to perform a cure. Injections of stimulants, tonics, and astringents, will commonly arrest the muco-purulent discharge. Solutions of the salts of lead, zinc, copper, iron, silver, and other metals, have been and are still employed to check the annoying flow; and the stronger the lotion, the more unsatisfactory the results. The greatest ingenuity, and the widest range of experiment, have been brought into requisition to subdue the obstinate discharge. A dilute form of the watery extract of opium, and ice cold water, have obtained some favor on the hypothesis that the prolonged flow of mucus depended upon secretory irritation of the urethral lining. The injection of dilute aromatic wine, as recommended by French surgeons, has proved successful in a multitude of instances. As a substitute for that famous lotion, I have generally employed elixir vitriol as follows:

℞ Pure water, f℥iv.
Aromatic sulphuric acid, gtt. xvi. M.
S. Wash. Use with a glass or vulcanized rubber penis syringe, several times a day.

Instead of prescribing according to the above formula, I frequently write for a half fluid ounce of elixir vitriol to be put in a glass-stoppered vial—directing that two or three drops be used in a half wineglass of water. This saves the patient expense, and the trouble of repetitions of the prescriptions at the apothecary shop. If the lotion be too strong, the object for which it is used is defeated; therefore I enjoin upon the patient the importance of strictly following directions.

Port wine, diluted with three or four times as much water, serves a good purpose occasionally, in the successful management of gleet. A cold infusion of hydrastis is another lotion from which great benefits have arisen. A perverse case may require a trial of every means known to the experienced practitioner, before success can be obtained. Mild and gentle agencies succeed the best; therefore the medical adviser should be slow in adopting harsh measures—such as blisters, and issues to the perineum, and caustics to the urethra. The most serious consequences have arisen from the untimely and injudicious use of *heroic* means. The employment of medicated bougies has received a share of professional attention in the treatment of gleet, but it is more than probable that the medication has been too highly estimated. A bougie lubricated with sweet oil or glycerine, accomplishes about as much as when anointed with astringent or anodyne cerates. The internal use of iron, copaiba, cantharides, and other agencies employed sometimes in the treatment of acute gonorrhœa, has occasionally cut short a protracted gleet. These remedies generally do the best when they follow the action of a cathartic.

Stricture is frequently the cause of gleet; therefore an obstinate case of the latter complaint, after the usual remedies have been tried unsuccessfully, should be treated by the introduction of bougies. If a tender point be discovered just behind the fossa navicularis, and another several inches lower down in the urethra, there is an indication for the daily use of a set of bougies. The English made instrument—not conical—for ordinary soft strictures is the best. For a urethra of common calibre, a No. 8 will be about the size for a trial. As the meatus is ordinarily the smallest part of the urethra, a bougie easily passing that point will go clear to the bladder without force, unless the canal be obstructed with strictures, or tender, spongy, and swollen places. If a No. 8 will readily pass, a No. 10 may be tried, and then a No. 12, if the passage of the smaller bougie indicates sufficient calibre for a larger size. The mechanical pressure of the bougie is what aids in the cure. If the instrument be so large as to tear the narrow parts, hemorrhage may ensue, or a violent degree of inflammatory action. A bougie may be employed to advantage, twice a day in the cure of gleet and stricture, and retained three or four minutes each time. This operation not only arrests the gleety discharge, but relieves the loins, perineum, and adjoining parts of that disagreeable heaviness which so often attends stricture of the urethra. Chronic irritability of the bladder—known by inability to sleep the whole night without being obliged to wake and micturate, and by the presence of mucus in the urine, which settles in the bottom of the vessel—is generally cured by the faithful employment of bougies. Catheters and metallic bougies are not suitable for treating soft strictures, following urethritis. In the use of bougies, care must be exercised not to irritate the neck of the bladder. The egregious mistake of attempting to dilate the sphincter vesicæ, under the impression that it is a stricture, would be unpardonable. The bougie should be introduced into the urethra, twice a day at first; then, after a few weeks, once a day, and finally once in two or three days.

Epididymitis needs no special treatment, except the use of a suspensory bandage. A saturnine lotion in addition could not do harm, and might exert a beneficial influence. The skin of the scrotum is too thin and delicate to bear with impunity, aconite, chloroform, or stimulating and irritating liniments. Sometimes the use of a bougie in the urethra will relieve the pain and heaviness of the spermatic cord and testicle. However, the chief reliance is to be placed upon the support given by a good suspensory bandage.

Orchitis is treated in a variety of ways. In hospitals the tunica albuginea has been incised and quite satisfactory results have followed. In private practice few patients can be found who will submit to the execution of the plan. Cooling and anodyne lotions, with the aid derived from a suspensory bandage, may be sufficient for an ordinary case, but the more severe forms of the difficulty require other measures. Aperients and emetics should be tried, and then quinia. An attack of orchitis is ushered in with a "chill," which depends upon a deranged stomach, hence the demand for cleansing and constitutional treatment. If these means do not succeed in arresting the progress of the difficulty, the swelled testicle should be compressed with strips of adhesive plaster. To apply adhesive strips properly to an inflamed testis requires tact and skill. The strip, after it is cut a half inch wide, and heated, is to be wound around the spermatic cord and upper extremity of the swollen organ. This will prevent the testicle from slipping through and above the plaster dressing. To secure this object with the first piece of adhesive material, the left hand grasps the stone and gently drags it downwards, while the right hand snugly wraps the strips of plaster around the cord and its scrotal coverings. The constriction thus affected, produces a blue strangulated appearance of the parts below, which, to the inexperienced, may seem dangerous; however, there is nothing to be feared. The second strip is to be applied below the first; and the third below the second; each turn slightly overlapping the one above.

The lower part of the tumor is to be covered by the application of a few short strips laid on the other way, *i. e.*, vertically, and not circularly, as the long strips were used. This completes the dressing, and the process excites very little pain. Generally immediate relief is experienced, and the swelling subsides rapidly. In two or three days the dressing, which gets loose, should be taken off, and another applied. While removing the strips, scissors may be required to clip the entangled hairs. In some instances the first dressing accomplishes so much that a second is not needed. Rarely is more than the third dressing demanded.

A swelled testicle of the acute variety seldom suppurates if treated as just indicated. If suppuration has commenced before the case falls into the hands of the physician, the tumor should not be compressed, but poulticed until it is ready to be lanced.

During convalescence the scrotum should be supported in a suspensory bandage, and active exercise avoided. If there be a recurrence of the inflammatory attack, the treatment may be repeated. The introduction of an irritant into the urethra to bring back the discharge, which may have been arrested during the swelling of the testicle, is entirely unnecessary. If the discharge return after the swelling of the testicle subsides, injections should not be used for several days, lest a relapse of the orchitis be provoked.

Treatment of Gonorrhœa in the Female.—On account of a decided variation in the construction of the genital organs of the two sexes, the female requires different treatment from that recommended for the male. Copaiba, cubebs, and other reputed antigonorrhœal remedies, are entirely useless in the female, for the disease in her is confined mostly to the vagina. In the early stages of the malady she is benefited by cathartics, and water used frequently with a vaginal syringe. To allay nervous and vascular excitement Indian hemp may be employed. Swelling of the nymphæ and adjoining parts, generally subsides under the influence of rest, and cooling applications. Lint saturated in a weak solution of acetate of lead, and pressed between the labia, is both useful and agreeable. This lotion protects the delicate integuments, which are irritated and excoriated by acrid discharges from the vagina.

As soon as the violence of the symptoms begins to abate, astringent washes may be employed. The ordinary rubber syringe, having hose, and acting like a pump, is the best for an aqueous douche, but a glass or vulcanized rubber instrument is preferable for medicated washes. The patient should be instructed how to use a syringe, and impressed with the importance of thoroughly employing whatever is recommended. A lotion to be effectual, must reach the folds and deeper parts of the vagina. Weak solutions of alum, zinc, lead, and other astringents, should be injected several times a day; if employed often and faithfully, they will soon arrest the discharge, and overcome the specific character of the disease. Lotions which will stain the under-clothing should not be prescribed.

Prostitutes being commonly too indolent to use washes faithfully are sure to neglect them, and to demand internal remedies only. And as they indulge in all kinds of excess, they are not readily cured. Not unfrequently they continue to ply their vocation while being treated, exposing themselves, of course, to a fresh contagion, and then complain because a cure is protracted. Such persons ought to be under rigid police regulations. Some females are unpleasantly affected by washes injected into the vagina. A "chill" and abdominal pains of a serious character, occasionally attend the douche treatment. To avoid such accidents, a medicated cerate or pomade may be employed instead of lotions. *Unguentum aquæ rosæ*—commonly known as *cold cream*, moderately medicated with astringents, is a useful ointment for the purpose. The patient may envelope the forefinger in a soft cloth, and having smeared it with the cerate or pomade, she can easily apply it to the walls of the vagina. An application of this kind employed several times a day, will soon effect a cure.

Treatment having to be suspended during menstruation, females affected with gonorrhœa do not always make rapid recoveries. Many women are normally sufferers from leucorrhœal discharges; therefore it is difficult to determine when they are free from gonorrhœa. A man who indulges in promiscuous sexual pleasures, is often punished for his temerity. A woman of the town, holding from her physician a certificate as proof that she, for the time, is exempt from venereal diseases, may be a magazine of dangerous explosives.

SYPHILIS.

The history of the origin of syphilis, though interesting to the student in quest of knowledge pertaining to the morals of the different races of mankind, is of little importance to the practical surgeon. Ancient literature, and Dr. Adam Clarke's comments upon Psalm xxxviii, are quite convincing that a disease closely resembling syphilis, if not identical with it, is not of modern origin. Attempts to fasten upon the companions of Columbus, the introduction of syphilis into Europe, are not worthy of serious consideration. Savage tribes discovered in new countries for the first time, are found to be free from venereal taints; and the bones of pre-historic man do not present syphilitic nodes.

Syphilis is a pathological entity, or multiplicity of entities, having a virus or yeast-like poison which may be communicated from one person to another by inoculation or contact. Sexual intercourse is the common method of transmission, though the disease is not unfrequently taken through the medium of contaminated lips, and rarely by infected clothing or privy-seats. A medical man while making digital explorations, is exposed to the disease if the finger employed have the cuticle broken by puncture, abrasion, or hang-nail.

Syphilis does not always exhibit the same phases in the course of its development, though its various manifestations, whether appearing in regular order, or straggling in vicariously, are generally too well marked and distinctive to be misapprehended. One syphilitic exanthem may widely differ from another, but in the variance there is no resemblance to other exanthemata, therefore a doubt in regard to the character of the disease rarely arises in the mind of even an inexperienced observer.

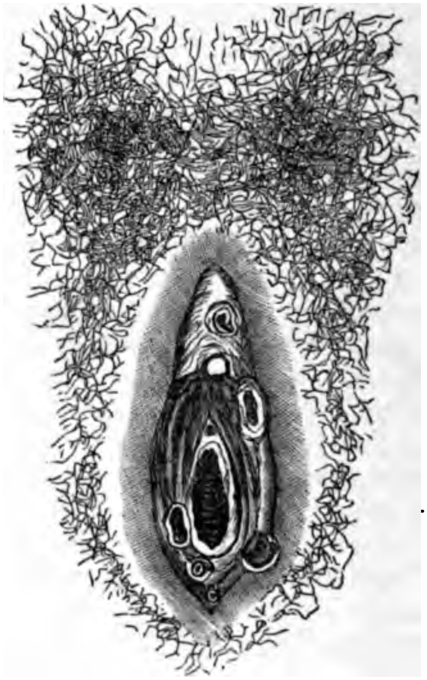
For convenience of description syphilitic manifestations have been divided into *primary*, *secondary*, and *tertiary* forms, though these terms have no special significance. The initial or primary lesion is called a *chancre*, and generally appears as a sore or ulcer upon the genital organs; secondary phenomena are characterized by a season of febrile disorder, eruptions upon the skin, ulcers upon the tonsils, fissures of the tongue and lips, falling of the hair, iritis, and ulcerous disease of the roots of the nails; tertiary disturbances come later, and are not orderly in their development. Periosteal irritation, ostitis, enlargements of the tendons, deposits of cacoplastic material in glands, multiple abscesses, loss of substance by ulceration, softening of the brain, and adventitious deposits in the cerebral mass, are among the most frequent and prominent of tertiary manifestations.

The virus of a chancre is easily transferred from one person to another by inoculation or when brought in contact with a mucous surface; the poison of a secondary sore is less readily transferred from one individual to another, and then only to communicate the disease at a stage of development corresponding with that from which it comes. It requires from twenty-five to thirty-five days for a primary chancre to show itself after the seed has been planted, and the sore always appears at the spot where the inoculation was made; but when a woman or child receives on the lip a poison imparted by a secondary sore on the lips of a man, the virus does not have to slumber a month or so before a chancrous ulcer appears, but the irritation commences immediately in some instances, in a week in others, so that ulcerative action is manifest in a few days, and other secondary manifestations may come in quick succession, and not after several months, the time usually intervening between the primary lesion and secondary phenomena.

The disease taken in the secondary form is not likely to be followed by tertiary phases. It is not easy to account for this seeming departure from the course followed when commencing in primary chancre; but the virus thus imparted may not be so virulent, or lack in powers of evolution. A man who has passed through the primary and secondary phases of syphilis, and has tertiary manifestations, can not hand down the disease to a child begotten after the secondary signs have all vanished, nor can he impart the disease to a woman by copulation unless he have a tertiary sore on the penis; and in that case the woman would only suffer from a local ulcer. From these general statements it will be seen that syphilis is a constitutional or systemic disease that is communicable as such in its primary and secondary forms or stages, but can not be transmitted in its tertiary form or stage, except incidentally or accidentally as a local sore. A man with tertiary troubles may marry a woman and have children by her, yet not impart the disease to mother or offspring. However, it is found that about the time that there is a transition from the secondary to the tertiary stages of the disease, hereditary transmission is possible long after contagion is impossible. It has also been observed that the children of a man, tainted with syphilis, who marries and has progeny, gradually escape the morbid influence, the first-born being more thoroughly infected than those born a few years later. This shows that the force of the disease grows weaker from time to time; and it is quite certain that the morbid influence at length ceases to be detrimental to physical well-being. There is a popular notion that a venereal disease, like a cancer, grows worse and worse, until deformity and death end the scene, if not held in check by judicious medication. On the contrary, we know that the disease may spend its force and virulence, and eventuate in health, though no remedy be employed. Treatment is adopted for the purpose of mitigating the worst symptoms, and shortening the period usually consumed by the disease in going through with its various evolutions.

Chancre.—There are two kinds of venereal ulcers, known as chancres—the one is purely a local disorder, and contains no poison which enters the circulation and produces systemic phenomena; the other is a lesion which is merely an early phase of series of manifestations beginning in contagion and ending in variety of morbid sequelæ requiring years for their evolutio The local disease, called *soft chancre*, does not come from a entirely distinct virus, but from some modification of the origina disease. I have already stated that a man laboring under tertiar syphilis, and having a sore on his penis, may convey a virus t

FIG. 49.



Multiple or soft chancre—local disease.

the woman he cohabits with, but the poison only produces a loc sore, no constitutional contamination coming from it. This so may take on a phagedenic condition, and do a great deal local mischief—it may produce a sloughing bubo, and becom dangerous to life, yet never be attended or followed by what ordinarily pass as secondary phases. This sore, in a certain sense, i hybrid. While it may go on in the active reproduction of it own kind, it has not the power to start off a train of evolution that sooner or later follow a *hard chancre*.

A peculiarity of the virus of the local disease is, that it generally produces several sores on the genitals, and all are about th same age; they incline, by ulcerative action, to coalesce, making one or more large sores. The local disease begins, so far as our observation extends, in the development of vesicles a day or two after the virus is received; a couple of days more will convert the vesicles into pustules; and when these break, small ulcers are formed. The sores are red, sensitive, and inclined to spread by the edges becoming undermined, and the borders tumbling in as minute detachments at first, and as appreciable sloughs afterwards.

The virus of local syphilis will make as many sores as there are inoculations or introductions; and an individual undergoing a siege of constitutional syphilis may take the disease, if exposed to its influence, as readily as a person who has never had any kind of venereal infection. The disease may be taken a hundred times, for it makes no constitutional change, as do small-pox, mumps, and measles.

The local venereal sore is to be treated by applying to the ulcerated surface a remedy which shall destroy the power of the virus to spread. The poison extends to a certain distance beyond the bottom and borders of the ulcer; therefore a caustic that merely burns the suppurating surface of the sore, is not likely to reach the entire amount of virus, consequently the ulcerative action may not be stayed. Chloride of zinc is one of the most efficient caustics that can be employed in the destruction of the virulent principle of a chancre; it may be made into a pasty mass, as follows:

℞ Chloride of zinc, ʒii.
Pulv. acacia, grs. vi.
Pulv. bloodroot, grs. viii. M.
Using a few drops of water to form a thin paste.

This may be kept in a vial or crock for several days, yet it should not be relied upon for weeks or months, as the mixture is subject to various changes.

This penetrating escharotic is to be applied to chancres, and kept in contact for half an hour or so, a piece of lint being used meanwhile to wipe the edges of the sore, thereby preventing the caustic from attacking the healthy surroundings. The cauterized sores may then be wiped dry, and sprinkled with pulverized chalk or any neutral or inactive powder. The same dressing may be used for three or four days, or until the slough forms by a separation of the deadened chancre from the healthy surroundings, a suppurating process completing the separation. The chasm formed by the slough is now a granulating sore, free from ulcerative poison, and will heal in a few days, whether let alone or treated with a weak solution of lead or zinc.

Instead of employing an escharotic, which is attended with pain, and followed by swelling, I have been using the following powder, and find that it answers a satisfactory purpose:

℞ Pulv. sub nitrate of bismuth, ʒi.
Pulv. salicylic acid, grs. x. M.

Sprinkle the ulcer with the mixture three or four times a day, and wash the sore once a day. I have thus obtained a cure in ten or fifteen days.

To make a sluggish sore heal more satisfactorily, it is well to give the patient iron and mineral acid, to improve the digestive and nutritive powers. A good diet should be employed; and every condition favorable to reparation should be pressed into service. There is no occasion for the use of medicines ordinarily regarded as "anti-syphilitics," for there is no constitutional contamination to overcome.

Phagedenic and serpigenous ulcerations are to be arrested by the use of chlorine washes, and carbolic acid graded as to strength of solution by the activity of the disease. I have used a wash made from chloride of zinc for phagedena, and a mild mercurial ointment for serpigena. Phagedena may be successfully attacked with carbolic acid, chlorinated washes, solutions of myrrh, or permanganate of potash. The chloride of zinc paste is competent to arrest rapidly spreading ulcerative states. Fœtid and acrid discharges are overcome by the topical use of salicylic acid. The inmates of low brothels seem to possess a variety of syphilis which imparts a peculiarly destructive virus, all the sores following inoculation exhibiting a phagedenic tendency.

It requires from ten to twenty days for an ordinary chancre to heal; and if the subject be enfeebled, a longer time will be consumed in the healing process. The devitalized and the depressed may need the bracing effects of iron, and the bitter tonics, to arouse the digestive powers, and to promote nutrition and reparative action.

Venereal sores do not require so much burning with caustics as was formerly supposed. Many syphilitic ulcers demand no escharotic action, but the application of an agent which neutralizes the zymotic poison. If an escharotic be used it should be of the penetrating kind which confines its action to the chancrous structure and does little harm to the adjacent tissue. Chloride of zinc, therefore, is preferable to the Vienna and lunar caustics. Nitric acid at full strength, and applied with a pencil of wood, is an excellent caustic, especially if it be made to burn as deep as the chancre extends. When this escharotic is used, the sore must be closely watched from day to day, and the caustic action renewed as often as the ulcerative disease seems to possess activity.

In the management of local syphilis there is no call for the employment of iodides, mercurials, and "alteratives." Although it has been customary to administer such agencies under the plea that the patient is better satisfied, and that something is gained in the event that a mistake has been made in the diagnosis, it is none the less unwise to prescribe a constitutional remedy in the treatment of a local disorder.

When a chancre forms on the edge of the prepuce and renders the border of the opening too sore and unyielding to allow retraction, though another ulcer occupies the sulcus behind the corona glandis, the hidden chancre may be reached by the use of a syringe. If it seem essential to uncover the ulcer, the patient may go under the influence of an anæsthetic while the prepuce is forcibly retracted, the ulcer cauterized, and the foreskin returned. The syringe may be used every day afterwards until the hidden sores have healed, the wash being a weak solution of carbolic or salicylic acid. Nothing strong and irritating should be employed, lest swelling of the prepuce take place, and other untoward complications arise. If the border of the foreskin be held close to the nozzle of the syringe, all the space between the prepuce and the glans may be washed. It is not generally proper for a surgeon to administer chloroform without a third party being present, but under these circumstances the risk may be taken.

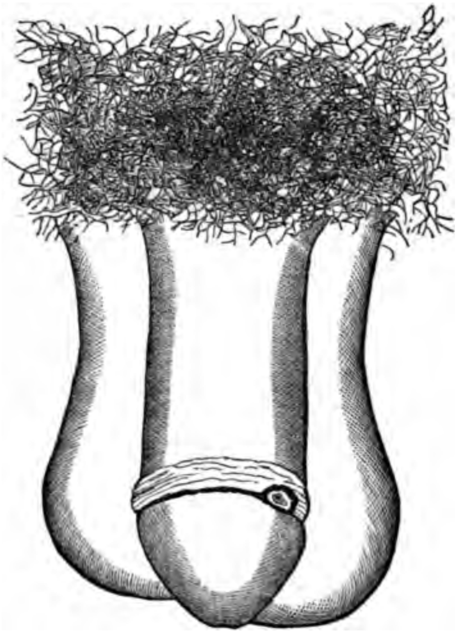
A chancre in the fossa navicularis may be brought into view by using two hair pins as dilators of the meatus. These implements may be bent at right angles near the bow, and the free ends used as handles. They are cheap and efficient. A cicatricial stricture is apt to follow the use of caustic in the urethra, therefore the salicylic acid and borax powder should be employed instead of any kind of escharotic.

The bubo that attends local syphilis, does not indicate systemic invasion, but it comes from the absorption of an animal poison on the part of the lymphatics. It is acute in its development, and is liable to suppurate. The rapidly forming abscess may be aborted by the topical use of anodynes, yet if suppuration be imminent, the bubo is to be poulticed, and at length evacuated by means of a bistoury. There is nothing gained by opening a syphilitic bubo with caustics. Let the abscess be freely incised, evacuated, and washed out with a weak solution of carbolic acid. Under the influence of disinfecting washes and Mayer's ointment, the wound and sore heal satisfactorily.

Hard Chancre.—As has already been stated in other language, true syphilis in its initial form, appears as an indurated chancre. It is not painful, and discharges an ichorous fluid. The ulcer is almost always single, and does not appear until twenty or thirty days after inoculation. At first it is a tubercle, papule, or nodule, and then it desquamates and undergoes erosion. The edges of the sore are not ragged and undermined, but hard, smooth, and rounded. The secretion is scanty, and generally ichorous, though it may become profusely purulent and sanious. The tissues immediately adjoining the ulcer, constituting its base and its walls, usually take on a gristly hardness, hence the name, *indurated* chancre. "It feels," says Bell, "as if a split pea or small acorn cup were inserted under the skin." Instead of having a red areola surrounding it, the true chancre has a pale, anæmic, protuberent border which glistens like the tense edge of an indolent crural ulcer. The location of the sore, condition of the patient, and other influences, modify the appearances of the ulcer, so that, in some instances, the best observers might be in doubt in regard to the kind of chancre under inspection. In a more advanced stage of the disease such symptoms appear as render the nature of the morbid principle unmistakable. It is desirable to ascertain at the start whether the disease be local or systemic in character, yet the earliest and most active treatment will not prevent constitutional invasion, nor essentially mitigate the subsequent phases. True chancre appears twenty-five days—more or less—after a suspicious intercourse; it is single, indurated, and desquamating; and although it may cause enlargement of the inguinal glands, a suppurating bubo rarely if ever appears. On the other hand, the earliest manifestation of local syphilis appears in five or six days after impure cohabitation; is soon multiple if not so from the beginning; and the sores present a spreading tendency, rapidly growing deep and broad. Parts resting against a sore become consecutively inoculated, consequently the destructive capacity is very great.

By a comparison of the distinctive features just enumerated, it can commonly be decided whether the local or systemic form of disease is present. In the local form of syphilis there is no period of incubation, as it may be called—a period which lasts twenty or thirty days—but the work of destruction begins at once—at first as a vesicle, then as a pustule, and finally as an ulcer through a bursting of the walls of the vesicle and pustule.

FIG. 50.



Single chancre—constitutional disease.

The true chancre seldom assumes a spreading form, but local syphilis frequently takes on a disintegrating or sloughing state which is dangerously destructive to the parts involved. This condition is called *phagedena*, on account of its ravaging character. An enfeebled state of the vital powers, whether brought on by mal-nutrition, over-work, debauchery, or disease, is favorable to a phagedenic state of syphilitic ulceration.

Serpigenous erosions come from some peculiarity of the local forms of syphilis, and do not indicate systemic invasion. They seem like worm-eaten tracks, and rarely strike deep. They may be cured by topical applications. Mild mercurial ointments commonly put an end to the creeping ulceration.

The single, indurated, slowly developing, *true chancre*, which always appears at the point where the virus entered the absorbent system, does not manifest itself until the syphilitic poison has been coursing the vessels of the body for days and days, therefore if it were excised as soon as discovered, the contaminating principle in the organism would not be lessened; and the disease would not be prevented from going through with the various phases which constitute fully developed constitutional syphilis. In this respect the morbid career is much like that of the vaccine disease. The bovine virus is introduced into the circulation through an abrasion; and it remains in the fluids of the body for a week or so, and then returns to make a pustule at the point where the vaccine poison entered; and if the pustule in its incipiency be excised, the protective influence is not destroyed.

Some individuals who expose themselves to syphilitic contagion, wash exposed parts as soon as the sexual act is finished, but they do not always escape contamination. It does not take a minute for the absorbents to carry the virus beyond the reach of water or medicated washes, consequently there is no safety in prophylactic means, unless a condom be regarded as such.

It may be repeated here, that soft chancre—local syphilis—may be taken any number of times, for no systemic change is produced by its presence; but true syphilis has but one career, as have small-pox, measles, and scarlatina. These diseases as they pass through the fluids and solids of the body, make an impression that is lasting—they are systemic ailments. True syphilis can enter the organism but once; but an individual's body thus occupied with the venereal taint, is not exempt from soft chancre, any more than it is from gonorrhœa or parasites.

It generally requires a year for syphilis to exhibit its leading phases, and two or three years for its later features to be reached. In some individuals the effects of syphilis last through life; and not unfrequently the disease is the cause of premature death. Nodes on the bones last as long as the skeleton; and a scrofulous person is hurried into tuberculosis by the devitalizing influence of syphilis.

Treatment of Constitutional Syphilis.—The earliest phase of systemic syphilis, as has been stated, is the initial sore or chancre;

and this generally appears upon the frænum, the glans, or in the sulcus behind the corona. It may lay hold upon the edge of the prepuce, and upon the side of the meatus, even creeping in as far as the fossa navicularis. Females exposed to the contagion of syphilis, become inoculated in the the folds of the ostium vaginæ, and the fourchette. The cervix uteri may have a syphilitic sore developed upon it; and so may parts in the immediate vicinity of the genital fissure. Inasmuch as there exists no pressing haste for the cure of an indurated or true chancre, no caustics need be used, but the sore may be dressed twice a day with the following powder:

℞ Pulv. borax, ʒii.
Pulv. salicylic acid, grs. x. M.

This will favor the destruction of the chancre, and a reparative action. But as most patients are desirous of seeing rapid progress made in the destruction of a chancre, it is often a good stroke of policy to apply a caustic in the beginning, the chloride of zinc paste being the best escharotic that can be used. After the chancre has been deadened with the caustic, the sore may be dressed twice a day with salicylic or carbolic acid. The chancrous slough will come away in three or four days; and the ulcer will heal in a week or two. But this will not be the last of the affair. In a few months, the patient will begin to suffer pains in the muscles and bones, and to show signs of physical decline. There will be feverish flashes, poor appetite, bad digestion, loss of flesh, sallow skin, dejection of spirits, cough, night sweats, and perverted secretions.

At length a copper-colored eruption will appear upon the face, neck, and anterior aspect of the body. This will be attended with relief from the previous pains and feverish symptoms, as is the case in other eruptive diseases, yet the unsightly efflorescence will alarm the sufferer. He will be importunate in his demands for a riddance from the hateful stains. The following unguent is quite efficient in lessening the eruptive manifestation:

℞ Simple cerate, ℥iss.
Citrine oint., ℥ss.
Oil bitter almonds, gtt. x. M.

But it is now time to commence a course of dietetics and medication, if it has not been begun before. The patient is to be fed on the most acceptable nutrients and appetizing dainties. The disease is devitalizing, and it must be met with invigorators. It is to be borne in mind that there is no antisyphilitic medicin which will enter the solids and fluids of the body, and *ther* neutralize the poison, or seize the hideous monster and drag i forth; but the devitalizing influence or entity is to be counteracted in its tendencies by the discreet employment of those agencies which favor digestion, absorption, and assimilation. Th destructive career of syphilis can be mitigated and abridged, bu not wholly strangled and overthrown. Many of its disagreeabl features may be prevented or ameliorated, yet not entirel squelched. Daily chills may be overcome by the use of tw drops of Fowler's solution of arsenic every four hours; an night sweats may be stopped by the judicious employment o sage tea, elixir vitriol, or sulphate of atropia. Pains in th muscles and bones may generally be relieved by a daily indul gence in a hot bath. Restlessness at night can be subdued by dose of chloral and morphia.

A drop or two of nitric acid in a wineglass of water, an repeated every three or four hours will whet the appetite, an promote digestion. The following powder may be taken for similar purpose:

℞ Sugar of milk, ʒiii.
Pepsin, ʒi.
Salicylic acid, grs. vi.
Sulphate strychnia, gr. i. M.
Dose, what will lay on a three cent piece every three hours.

The powder may be thrown upon the tongue and washed dow with a swallow of water; or mixed with water and then swallowe Inasmuch as patients have to be under treatment for weeks an months, it is necessary to change the medicine occasionally i order to satisfy the expectations of the patient, and to effect a much as possible with a medicinal course. Most remedies los their powers over disease after being taken steadily for severa days, consequently it is judicious to modify the medicine occasionally. The following compound may be given to advantag in the course of the treatment:

℞ Pulv. sulph. magnesia, ℥iii.
Pulv. sulphur, ℥i.
Pulv. cubebs, ʒss. M.
Dose, a quarter of a teaspoonful, in water, four times a day, every other day.

Alternating with a day's medication of acid solution of iron, in four or five drop doses every three hours, the medicine being administered in a half wineglass of water.

Although mercury has been considered an efficient antisyphilitic, it is questionable whether it exerts any special control over constitutional syphilis. Once I believed that some phases of the disease under consideration could not be successfully managed without the influence of an active form of mercury, but experience has taught me that the agent exerts no marked control over the leading features of the malady. I have been sorry to see so much partisan feeling manifested in the discussion of this most important subject. If the medicine controls syphilis, all liberal minded physicians who know of nothing better, will employ it; and if it be nearly or quite powerless to subdue the prominent phases of the disease, the champions of a mercurial course ought to drop their prejudices, and form sound estimates in regard to its worth.

It is to be presumed that the local disease has tended to mislead the short sighted and the bigoted. If an advocate of mercury regards all varieties of syphilis as constitutional, and thereby thinks he has prevented systemic invasion by the administration of hydrargyrum, when really no internal medicine was needed, he is likely to have deceived himself into the belief that constitutional contamination was prevented by the mercurial employed. And, on the other hand, the champion of vegetable alteratives may have committed a similar blunder by ascribing results to the action of medicine when nothing valuable had been accomplished. The haters of mercury have declared that a deleterious influence of the medicine often got mixed with the venereal taint, and produced, by some mysterious conjunction, a compound mercurio-syphilitic disease which is next to incurable, and more obstinate than the original complaint. As this hostile feeling is likely to be kept up for several generations, it is useless to attempt to settle the question at this time; but I would suggest that the less prejudice there be in the investigation of the subject, the sooner will the truth be reached. In making observations to test the question, it should be borne in mind that vital action and the recuperative powers of the body, are ever busy in the work of recovery, and in many instances will accomplish all that may be desired without medicinal aid. Treated in whatever manner, constitutional syphilis is prone to relapse or to exhibit paroxysms of aggravation, therefore a series of back-sets should not necessarily be ascribed to faulty medication, but rather to a feature of the disease. However, it is generally judicious to change the medicine when unfavorable symptoms appear.

The mouth and pharynx are favorite sites for the location of secondary phenomena. About the time the first eruption begins to disappear, the tonsils are liable to become ulcerated; and at the same time ulcers and fissures form on the tongue, lips, and inner walls of the cheeks. A rough or projecting tooth often establishes an ulcer upon that part of the tongue or cheek which rests against it. The uvula and soft palate are liable to these ulcerative attacks, and the destructive tendency may endanger the use of the parts involved. Gummata, or mucous tubercles, may exhibit themselves about the mouth and lips, and upon the genitalia; and these may degenerate into ulcers, or become nodules that yield to erosive influences.

The labial, oral, faucial, and pharyngeal ulcerations are exceedingly disagreeable, interfering with the chewing and swallowing of hard or pungent food. The breath is fetid, the mucus of the throat so tough and clinging that it can not be readily expelled, and a troublesome cough, are complications.

To get rid of these morbid conditions, caustics, astringents, and correctives, are to be liberally employed. A solution of nitrate of silver, two or three grains to the ounce of water, may be applied to the sore places with some hope of a favorable impression. A weak solution of the chloride or sulphate of zinc will do well. A solution of borax and alum may exert a wholesome influence. A solution of borax and salicylic acid may produce a satisfactory result. This compound, though not strictly compatible in a chemical sense, has proved excellent in my hands. Nitric acid, applied to ulcers of the mouth and fauces with a spatula of soft wood, was once a favorite with me. Tincture of myrrh is not without its commendable properties; tincture of pinus canadensis is also valuable as a topical application; and a solution of permanganate of potash has been highly recommended. It has been found by experience, that the same remedy will not suit all cases, consequently several topical applications have been mentioned. Sores at the corners of the mouth may be treated with the following ointment:

℞ Simple cerate, ℥i.
Iodide of ammonium, grs. x. M.
S. Use night and morning.

During the time that secondary manifestations are in the mouth and fauces, the teeth are to be scrubbed often with a brush or swab. While any sores are about the lips and mouth, the patient should not kiss children, nor indulge in the dalliances of love, lest the disease be communicated to innocent parties. The skin should be kept clean and active by the daily use of warm baths, juniper scented soap being employed.

After the first eruption, which is generally a copper-colored stain, disappears, another of a desquamating character may succeed; and finally a papular disease may show itself. These syphilitic eruptions generally yield to the iodide of ammonium ointment, and also to the mercurial unguents.

When an ulceration sets in at the roots of the nails, the parts affected should be cauterized with a strong solution of carbolic acid, a thin spatula of wood being used to carry the escharotic to the depths of ulcerative action. The disease rarely attacks more than two or three nails on each hand. The manifestation comes from the extension of the skin disease to the matrix of the nails. In some instances the nails are lost, and then replaced with a distorted bony substance. While the disease is active, gloves should be worn.

The hair at its roots may become implicated in the morbid cutaneous action, and fall off rapidly. Alopecia is not a complication in all secondary cases, but is frequent enough to demand attention. It is first noticed while dressing the hair, the comb and brush filling quickly every time they are used. The top of the head is the first to become bare, yet little time is required to clear the scalp to its borders. The eye-brows and beard are occasionally lost, giving the patient a ludicrous appearance. The following pomade is excellent to revive the deadened hair follicles, and to hasten a new growth of hair:

℞ Glycerine,
Rose water, aa. f℥iiiss.
Tinct. cantharides,
Fowler's solution, aa. fʒiv. M.
S. Use on the scalp twice a day.

This mixture is also efficient in restoring hair that has been prematurely lost from any cause. It is to be borne in mind that the pomade is not intended as a hair dressing, though it does well as such, but as a renovator of the roots of the hair; consequently it is to be rubbed into the scalp.

During the time that a syphilitic taint is quietly continuing in the organism, its manifestations not being prominent enough to determine whether it be in a secondary or tertiary state, it is not uncommon for a vesicle, pimple or pustule, to appear on the glans penis, and degenerate into a small ulcer. This is apt to appear after a sexual contact, therefore the patient becomes alarmed about a fresh inoculation. However, the little pimple or ulcer does not amount to much, and will get well of itself in a few days, without any treatment, though it is well to apply a small amount of powdered borax to the insignificant lesion twice a day until it has disappeared. The same phase of the disease may show itself two or three times in the course of a year or two, but will finally stay away altogether.

Tertiary syphilis embraces that period of the disease which is characterized by asymmetrical lesions of the bones, muscles, tendons, and deep structures of the body. There are several phases of syphilis which are difficult to classify or arrange, as they partake of the characteristics of both the secondary and tertiary divisions of the disease. For instance, iritis is a disorder not of the skin, nor of a mucous membrane, but of an *inner* or deeper structure; yet it is symmetrical in its manifestations, and is associated with secondary phases. So it is with syphilitic affections of the ear. However, the linings of the middle ear are merely continuations of the mucous surfaces of the nose and throat. It may be stated in this connection, that the iris is remotely associated with the skin, its colors conforming to certain hues in the dermic combinations. A light blue eye is in harmony with the blonde complexion, and a black iris with the brunette.

Syphilitic iritis is a complication dangerous to vision, therefore much wisdom is to be displayed in the management of the difficulty. The patient must abstain from using the eyes, and from exposing them to the influence of strong light. The diet is to be nutritious, simple, and easy of digestion; and the medicine should chiefly consist of peptics and such agents as sustain the vital powers. Mercury, cathartics, and other depressants, are to be avoided. The iodides occasionally do well in large doses, yet sometimes they do harm, especially in small doses, repeated day after day without any definite purpose in view, as these medicines are often administered. Sulphur may be taken in two or three grain doses every four hours; and Fowler's solution, in two drop doses, may be used on alternate days. For circumorbital pains the following mixture may be used:

℞ Tinc. aconite root, f℥iiss.
Chloroform, f℥ss. M.

S. Use upon the forehead every hour or two, and snuff the vapor when the suffering is most acute.

Periosteal pains in bones near the skin, especially in the tibia, are among the most frequent and prominent of tertiary phenomena. Quite often the periostitis results in an effusion of plastic fluid between the periosteum and the bone, constituting a lump which is an incipient node. In the course of time ossific matter will take the place of the effused lymph, and a true node will exist. In the cold and damp seasons of the year, and during changes of weather, the pains in a syphilitic bone are very intense and demoralizing;. they are often called neuralgic or rheumatic, yet names do not alter their character, nor aid in a cure. The periosteum is not usually very sensitive, yet when inflamed and rendered tense by effusions between it and the bone, the pain provoked is quite intolerable. The opiates do not generally give much satisfaction in the management of periostitis, though they may enable a weary patient to secure a nap, or even a night's sleep. The application of great heat serves an excellent purpose in alleviating the distress. Tincture of cayenne, kerosene, and other irritating and heating liniments, do some good. But the medicine which is not a mere palliative, yet a real subduer of the disease, is the iodide of potassium. This does little good in five and ten grain doses, but produces a decided impression when administered in from thirty to sixty grain doses, and repeated four times a day for two or three days. About as much time should then elapse without medicine, then the iodide may be given again, and so on, at intervals, until the disease is subdued. The salt may be dissolved in a half wine glassful of water, and then swallowed. It is useless, and even worse than that, to attempt to improve the action by using an "alterative syrup" as a vehicle.

I have frequently incised tense and inflamed periosteal membranes, and never failed to impart relief. Several incisions made parallel with each other, along an aching tibia, are often better than a single cut. In making incisions near the joints, care must be exercised so as not to open an articulation. The coverings of the deeper bones may be slit with a tenotome.

The subcutaneous injection of morphia, and chloroform, will temporarily arrest the most violent pain. The hypodermic needle should be entered near the focus of the painful area. The worst muscular pains can thus be assuaged, as well as those of a neuralgic and doubtful nature. Not unfrequently it is impossible to determine whether a periosteal pain is syphilitic or not, unless the patient is known to have had a venereal taint.

Tertiary affections of the nasal bones are comparatively rare, yet when they do appear the deformities they are likely to produce, are shamefully unsightly. As the thin bones become necrosed and disappear the bridge of the organ sinks and flattens, and the cartilaginous extremity turns upward, constituting an ugly pug.

When the periosteal disease attacks the nasal bones, the integument covering them becomes red and nodular, and dry crusts form in the deeper recesses of the nostrils. The headache attending these changes is frequent and distressing, and the breath is shockingly offensive.

The treatment in a general way should be nourishing and supporting; and such local measures should be adopted as are likely to restrain the destructive tendencies of the disease. A solution of carbolic acid should be injected as deep as the bone, a hypodermic syringe being used for the purpose when the inflammation is external; and the same agent should be carried to the deep recesses of the nasal fossæ. In some instances it might be impossible to arrest the progress of the dying and destructive processes, yet in most individuals the disease can be prevented from disfiguring the face. When the active part of the ulcerative disorder is in the nasal chambers, pieces of the turbinated and ethmoid bones coming away from time to time, a snuff which will overcome the disagreeable breath, and help arrest the progress of the morbid action, may be used. The errhine is composed as follows:

℞ Pulv. baberry, ℥i.
" sassafras, ʒi.
" salicylic acid, grs. x. M.
S. Use as a snuff several times a day.

The spray of dilute carbolic acid sent into the nasal chambers with an atomizer will exert a beneficial influence upon ulcerated nostrils.

Gummata, nodules, and mucous tubercles of syphilitic origin are to be cauterized, when within reach, with chloride of zinc, and then dressed with a powder which combines three parts of pulverized borax to one of salicylic acid. Such excrescences may also be successfully managed with carbolic acid, permanganate of potash, and vegetable astringents. Condylomata or moist papules in the vicinity of the mouth and anus, are to be treated in the same general manner.

Old "stagers" are frequently troubled with suppurating nodules, abscesses, and ulcerations in various parts of the body. Quite often these chronic sores will heal in one place, and break out in others, greatly worrying the patient. The scars which follow the healing process, are contracted and glistening, as if they followed a burn. The treatment for these irregular manifestations is to be based chiefly upon general principles, there being no demand for specifics. An individual having these later phases of syphilis can not impart the disease to another by sexual congress or any kind of dalliance. The morbid manifestation is a sequence of syphilis, and too enfeebled to reproduce itself. Syphilitics who are suffering from some of the irregular sequelæ are generally benefited by a few weeks or months sojourn at the Hot Springs of Arkansas. And, in fact, many of the secondary manifestations are hurried safely through by treatment at the Springs.

Infantile syphilis is that form of the disease in which a child is born of parents laboring under the earlier phases of the constitutional disorder; and soon after birth, at which time it may be smooth and plump, loses its flesh, takes on a simian appearance, cries much with a raucous voice, and is prone to gummata upon the scalp, lips, and genitals. This is not a tertiary condition of syphilis, for the nursling can impart the disease to any woman that happens to be unfortunate enough to give suck to the contaminated creature. A wet nurse who is free of syphilis should be careful what kind of infants she nourishes, for the disease occasionally gets into families occupying high social position. A parent who employs a wet nurse, and thereby contaminates an innocent party, may be held responsible for damages. Intricate cases in medical jurisprudence have grown out of alleged contamination from nursing infected infants.

The best remedy for a syphilitic infant is Donovan's solution. It may be given in drop doses on sugar every three or four [illegible] [illegible] of the [illegible] are to be [illegible] gummata [illegible] with [illegible] and [illegible] treated with [illegible] and [illegible].

Children constitutionally impressed with a syphilitic taint may have imperfect teeth and [illegible], but not necessarily. The temporary teeth are usually cut early, and soon decay; and the permanent set is rarely full and natural in appearance. The upper [illegible] [illegible], and stand apart; and the lower ones are [illegible] [illegible].

Syphilitic infants are liable to keratitis, [illegible], and corneal opacities which often terminate in blindness. They are also the victims of hydrocephalus, and systemic disturbances of various kinds which lead to fatal issues. A syphilitic child, with good attention and fortunate surroundings, may entirely recover, and manifest great physical vigor and mental strength all through a long life. An infant known to be syphilitic is not to be treated as if it would certainly die, or be an imperfect creature in the event that it survived childhood.

There is a wide spread impression that scrofula springs from syphilitic parents or tainted ancestors. That such a notion may receive the authoritative rebuke it deserves, I will quote from the teachings of no less a surgeon than Jonathan Hutchinson, F. R. C. S. The following words are from a discussion on some of the features of syphilis which was conducted under the auspices of the Pathological Society of London, Feb., 1876:

"Is there any reason to believe that a taint of syphilis may mix itself with other causes of disease, and produce results of a hybrid nature? It is to scrofula and scrofulous disorders that reference is here made. Does syphilis in any way predispose to scrofula or tuberculosis? Vague suspicions have been entertained on this head almost since the earliest date of recognition of constitutional syphilis; and opinions, often of a very sweeping tenor, have been expressed with great confidence by many authorities. Formerly, indeed, it was a question very difficult of investigation. I would venture, however, to submit to the Society that the facts which have been accumulated during recent periods, and the new symptoms that have been placed at our disposal, justify us in believing that syphilis produces in all its stages special and wholly peculiar lesions, and that although these may easily be mistaken for struma, they have in reality nothing whatever to do with that state of constitution. It is undeniable that syphilis, and sometimes the treatment required for it, may for a time enfeeble the system, and that during this state of debility a person predisposed to phthisis or struma may experience an increase of his proclivity. In this, however, there is nothing more than what is common to all causes of enfeeblement, whether special or otherwise; and I do not think that in the instance of syphilis it amounts to much."

In concluding the subject it may be proper to state that syphilis, for anything that is known to the contrary, may be entirely eliminated from the organism in a few years. The old proverb, "syphilis once, syphilis always," has no evidence of general truth. Some constitutions are not easily impressed by syphilitic influences; and others may possess the power to readily shake them off. On the other hand, certain organisms take in a large amount of syphilitic poison, then offer a good medium for the development of the ferment, and, finally, possess little power to cast out the devitalizing intruder.

VENEREAL WARTS.

Warty excrescences about the glans and prepuce of the male, and the nymphæ of the female, are not uncommon. Whether they were originally a variety of the common wart, or a distinct class of vegetations, is not known. In some instances they seem to spring from enlarged follicles in the skin or mucous membrane. Originating in whatever manner, warty vegetations are usually propagated by irregular sexual habits, as are syphilis and gonorrhœa. They are strictly a local disorder, though they may exist upon the genitals of an individual having constitutional syphilis.

Venereal vegetations are not so firm and broad as common warts on the hands and cutaneous parts of the body; but are soft, fungoid, and slender. The part of them which appears above the surface of the mucous membrane is quite red, as if vascular, and easily bleeds when roughly handled. Many warts usually spring from a single contagion, and the delicate shoots multiply rapidly. In some instances, where the disease is of long standing, the sulcus behind the corona glandis will become thickly studded with warts, and appear an unbroken mass of fungus.

Venereal warts secrete a thin, semi-purulent fluid, which is somewhat acrid, and highly offensive to the sense of smell. Occasionally fissures and ulcers appear in the fungous mass, as if a chancre had planted itself there. However, it is to be understood that venereal warts are neither gonorrhœal nor syphilitic, but they constitute a separate and distinct disease, although they may be associated with either or both disorders. .

It is easy to destroy venereal warts, if it be considered that the excrescences have a tap-root, like a carrot, and that chloride of zinc will kill such fungous structures, root and branch. A few grains of the salt are to be dissolved in as many drops of water, and then a small quantity of the liquid is to be transferred to the warts with a pencil of wood, care being taken to keep the caustic from the adjacent healthy structures, though only the vegetations will be destroyed by the escharotic. The pain attending the application is not great; and in two or three days from the use of the caustic the warts will be loosened to their roots, by the suppurating process, and ready to drop out. The chasm produced by the dislodgement of the warts, will soon disappear through the reparative process, and there will be no return of the disease.

SPERMATORRHŒA.

An involuntary loss of seminal fluid is denominated spermatorrhœa. The discharge usually occurs in emissions at night, during a lascivious dream, but in some instances the drain may be gradual, and take place in the daytime. Occasionally the flow follows micturition, or attends an evacuation of the bowels. There is a vast difference between the extreme ranges of the disease—between an occasional emission which is scarcely unnatural, and a driveling flow which fearfully depresses mind and body. In a state of health the male organs of generation in the adult are constantly elaborating semen; and when the seminal ducts and reservoirs are filled, there is an inclination to have them emptied. If the natural process by coition be not practicable, an illicit emission is effected, or is brought about by the agency of a dream. An emission may occur in the healthiest subject, therefore it could not logically be construed as evidence of disease. But, if the seminal loss occurs several times in a week, or two or three times in a night, the exhaustion is quite severe, and the sufferer is a fit subject for treatment. After months and years of excessive seminal losses by involuntary discharges, the entire organism becomes deranged—the mind gets weak and unbalanced, and the stomach ceases to perform its functions properly. The disease is often brought on by masturbation at an age when the nervous system is so highly impressible that it is easily damaged, consequently it is the duty of parents, teachers, and physicians, to impart wholesome advice to those lads who may be ignorant of the danger they are in. After a young man has practised self-pollution to a damaging extent, and has suffered from involuntary seminal discharges until he is physically and mentally an imbecile, he may not have the courage and resolution left to start on the back track, and regain his natural powers, therefore, if the victim of self-abuse be not warned in season, the remedy is everlastingly too late. A large proportion of those incarcerated in insane asylums, become deranged through perverted sexual indulgences, and the mental depression which is established by onanism. Epilepsy has been regarded as a result of self-abuse, but as a general rule such is not the cause. Epileptics commonly suffer from erotic desires and morbid sexual appetites, but the brain disease which produces the convulsions, may also be at the foundation of the sexual disorder.

The causes of involuntary seminal discharges, are so numerous, varied, and obscure, that to fully understand and appreciate them requires more than ordinary experience and acumen. Boys who have been troubled with incontinence of urine, and who have long and narrow prepuces, are apt to become victims to self-abuse and nocturnal emissions. After the age of puberty, they fall into extravagant notions in regard to the opposite sex, and become unreasonably shy about forming the acquaintance of companionable young women. This cowardice grows by what it feeds upon, so that in time the sufferer from seminal weakness becomes a victim of solitary debasement and sexual imbecility. At length the morbidly sensitive and masturbating individual imagines he is unfit for marriage and the higher duties of life, and gives way to fits of self-condemnation and despair. He imagines that he is not properly developed in his sexual organs, and that he could not effect sexual congress if he should marry. His despondency leads to dyspepsia, palpitation of the heart, disturbed vision, forgetfulness, constipation of the bowels, irritability of the bladder, headache, tired feelings, peevishness, pain in the back, and a multitude of other ills.

Often the victim of self-pollution and involuntary seminal losses, has had his case made worse by the representations of those who issue pamphlets, circulars, and advertisements, in order to scare the ignorant and swindle the inexperienced and the credulous. The reader of such literature is frightened into the belief that he can not be saved from idiocy or lunacy; and being thus discouraged, does not put forth the effort necessary to restoration.

Spermatorrhœa is to be managed according to its grade or condition. An individual who has a nocturnal emission only once in a week or two, and is otherwise in good health, may be told to go about his business, and indulge as little as possible in lascivious thoughts, and to give no attention to the advertisements of "specialists," who are generally deceivers. An occasional emission does no harm.

The young man who has two or three emissions in a week, and complains of a languid feeling the day following a seminal loss, should have the stomach and bowels put in good condition, and he should swallow a teaspoonful of lupulin just before going to bed. The medicine can be mixed in a wineglass of water and thus taken. The sedation the remedy exerts upon the genital organs, generally prevents a seminal loss. In addition, if the lupulin does not accomplish all that might be desired, a lump of camphor may be held all night between two opposing molar teeth. The vapor from this is breathed, and the anaphrodisiac effect may be beneficial. In order that the treatment shall have an opportunity to accomplish its best, the patient must go to bed regularly, and eat nothing outside of regular meals. The body is to be kept clean by daily bathing, yet a cold or warm bath just before retiring at night is not to be commended. Harm often resnlts from indulgence in a cold bath before going to bed, for the reaction is attended with a glow of warmth and excitement that arouses venereal desires. A young man may get rid of a teazing sexual appetite by having the body and mind engaged in some absorbing employment, especially if the labor be performed in company with others. Seclusion and solitary periods are to be avoided.

If the use of lupulin, and a course of regular habits, do not benefit the condition of a patient suffering from spermatorrhœa, the employment of a bougie twice a day should be added to the list of curative agencies. An English instrument, not conical, and number eight or ten in size, is best adapted to ordinary cases. The bougie should be lubricated, then slowly and carefully carried the whole length of the urethra, including the prostatic part of the canal. The instrument is to be left in place for a few minutes after it has been inserted. The first few introductions may be attended with some pain, but after the patient has acquired the habit of using the instrument, he will have no aversion to it, especially as he soon feels better in his loins and lower limbs. The feeling of lassitude and depression passes away under the judicious employment of the bougie.

In severer types of spermatorrhœa, in which the semen passes without erections or pleasurable sensations, and the mind is too feeble to execute a promise or good resolution, the patient has to be managed with much discretion. Besides the remedies already suggested, a pad is to be worn in the perineum, and so adjusted that it shall exert pressure just in front of the prostate. The compress may be a small rubber ball, oval in form, and held in place by two elastic straps which cross it and extend to a belt that surrounds the hips. The pressure exerted should be great enough to prevent an involuntary flow of seminal fluid. The scrotum and its contents are to be supported with a suspensory bandage, and the penis should be let alone, and not pinched and pulled at every time the patient urinates. The demoralized and disheartened sufferer is to be encouraged to attempt the execution of good resolves, and hope of recovery is to be awakened by the presentation of the most flattering phases of the case. Marriage is to be cautiously advised, though it has proved the best of remedies in quite discouraging cases. The marital relation being natural, it is generally safe to trust it in conditions otherwise unpromising. Even impotence has been overcome in a few months by cohabitation.

In this connection I condemn the use of caustics to the mouths of the ejaculatory ducts, as advised by Lallemand and those who have devised instruments for cauterizing the prostatic portion of the urethra. I have never known any substantial benefit to arise from such treatment, and have observed that much harm has arisen from the practice. Blisters, issues, and other revulsives applied to the perineum are seldom useful, and generally aggravations.

Certain phases of impotence may be rendered better by the local use to the uncovered glans penis, of the following lotion:

℞ Glycerine,
Cologne water, aa. f℥ii.
Salicylic acid, grs. iv. M.

The application provokes a glow in the virile organ, and favors a vigorous erection. The young and the excitable are not to employ any such stimulant, but it is designed for the impotent and those who fail to obtain erections when they are needed. The use of phosphorus as a remedy in the treatment of the impotent, has been attended with some remarkable cures; and since the agent has been put up in capsules or globules, the old objections to the administration of the remedy, are quite overcome. Musk has been recommended as a cure for impotency, but probably the agent is not as valuable as phosphorus.

In the management of spermatorrhœa, it will be found as difficult to strengthen the mind, and to establish a digestive condition of the stomach, as to restrain the seminal losses. In fact, the patient is apt to prove a troublesome customer and a bore, therefore, the medical and surgical adviser should secure good pay for his services. Although some specific agencies may be employed in the management of several phases of spermatorrhœa, in the main the practitioner is to rely upon general principles in the treatment of the complicated morbid states.

The prolonged use of the bromide of potassium, under the belief that it is a curative agent in the management of seminal weakness, often proves depressing and detrimental; and collinsonia, which has been so highly commended as a corrector of perverted states of the genital organs, rarely gives satisfaction, except as a general tonic. I have known the employment of "spermatorrhœa rings" to accomplish some good in cases where the erections are vigorous at the time of the excitement which leads to the seminal loss; yet where emissions occur before distension of the virile organ occurs, the awakening apparatus is valueless.

A ten to twenty grain dose of chloral, upon retiring at night, has prevented involuntary emissions, yet the agent is not so valuable a preventive as lupulin.

SECTION VI.

VASCULAR LESIONS.

When small vessels are lacerated, blood escapes into the areolar tissue and loose spaces between muscles and other structures. In the event of fracture, more or less vessels, perhaps capillary in size, are ruptured, and the extravasated blood finds its way among the soft tissues, and at length comes so near the skin as to show through, producing ecchymoses and discolorations. The amount of extravasation depends upon the number and caliber of the vessels torn. Dense structures resist the infiltration of blood, while loose tissues, like those surrounding the orbits, admit of free extravasation. At first the blood flows freely into the adjacent spaces, then a barrier having been reached, coagulation takes place, and for a time little apparent change is observed, but in a day or two the clot undergoes disintegration, and the constituents of the blood become separated, the fluid portions are absorbed, and the corpuscles slowly pass through changes which eventuate in liquefaction, or such transformations as to render them absorbable. In a few days, then, extravasated blood ceases to be such, and by the processes of absorption, assimilation, and elimination, its ultimate constituents are converted into something useful in the organism, or are thrown off as waste material.

In rare instances a clot of blood is permeated by budding vessels, and the mass becomes organized instead of undergoing decomposition, and those transformations which lead to repair or waste.

When a large quantity of blood enters a cavity, the heat sets up fermentation; and if the highly poisonous product be absorbed, it creates a septicæmic state in the organism, which is exceedingly dangerous. Sometimes the fœtid mass provokes inflammation, and an abscess results, which, when it breaks, discharges pus and the *debris* of the decomposed coagulum. Putrid blood confined in any of the serous cavities of the body generally leads to death, unless its liberation can be effected.

A blow or bruise may lacerate the inner coats of an artery, and not rupture the outer and stronger coat. This will not lead to extravasation or hemorrhage, but to interference with the circulation of the blood through the injured vessel. The force of the current may cleave the inner coats from the outer, and produce what is called a dissecting aneurism; or a thrombus may form at the seat of injury, which shall obliterate the vessel, or render it impermeable.

Occasionally the passage of a bullet, or the pressure of a foreign body, near a large artery and vein, leads to inflammatory deposits in and around the vessels, so that the channels become obstructed, if not entirely occluded. As soon as the lining membrane of a vessel is lacerated, or by inflammatory action is made rough by deposits of lymph, there exists a nucleus, or center, for continued deposits, and in a short time the sanguinary channel may thus be blocked up and permanently obstructed. A thrombus, or organized clot of this kind, follows atheromatous action in an artery, and leads to serious disturbances in the nutrition of the parts depending on the vessel for supplies.

When from rupture of the inner coats of an artery there is rapid dilatation of the vessel, the current of blood is much retarded so that coagulation takes place at the point of interruption, and a thrombus is established. In advanced life chalky deposits take place in the coats of arteries, and these become centers for the formation of thrombi.

In the application of a ligature to an artery, both of the inner coats are crushed or divided, and the canal is obliterated. Within a few hours after the operation a coagulum of blood forms above the ligature, and having filled the entire caliber of the tube, adheres to its inner coat or lining. The coagulum serves the purpose of a plug, and reaches to the first branch of any importance, where the current of blood prevents its further extension. The presence and operation of the ligature excite inflammation, and the effusion of lymph in and around the line of constriction. At first the ligature, the collapsed artery, and the adjacent tissues, are blended together by plastic or reparative material; but the ligature being a foreign substance, makes its way through the external sheath of the artery and the lymph, and being now disengaged, comes away. As fast as the ligature cuts the coat of the artery, reparation goes on behind it, so that there is a continuous thread or fibrous cord along the course of the original trunk, and it is not separated into two parts by the escape of the ligature.

In some cases the organization of the effused lymph about a ligature is so imperfect, and the clot in the artery is so defective, that the disengagement of the ligature is attended with an outburst of blood, which is called *secondary hemorrhage.* In such a case the clot or plug, and the lymph barrier, were not sufficient to restrain the impulse of the heart's action in the artery. Small arteries scarcely ever bleed after a ligature has been applied, but the larger the vessel the greater the danger of secondary hemorrhage. The increased peril comes in part from the force of the arterial current, and in part from failure in the formation of the coagulum, and some imperfection in the organization of the lymph at the seat of ligation. The innominata has been carefully ligated several times, but in every instance secondary hemorrhage has carried off the patient. But secondary hemorrhage depends much upon the proximity of collateral branches, therefore the ligation of a moderate sized vessel is not safe if a considerable branch is given off just above.

Sometimes an artery which is tied in the stump at the time of amputation takes on an aneurismal condition from disease of the coats of the vessel, or secondary hemorrhage occurs from a defect in the organization of the reparative lymph. The stump may ulcerate and even slough, and thus destroy the barrier which usually prevents bleeding.

The effect of the obliteration of the main artery of a limb would be gangrene, were it not for a re-establishing of the arterial circulation through enlargement of collateral channels; and as that is a tedious process, the extremity occasionally perishes before the change in the circulation takes place. After the ligation of a large artery, or obstruction of the circulation in a main arterial trunk, the limb becomes pale and cold; and to avoid gangrene, the extremity should be loosely wrapped in raw cotton, and laid in an easy attitude, so that the temperature may not get too low, and a cramped position of the limb act as an obstacle to a re-establishment of the circulation. The appearance of heat and redness in the skin may be hailed as a sign that the blood is finding its way along the superficial vessels; and an increasing coldness, and a mottled appearance of the integument, indicate imminent danger of mortification. It is rare for a limb which has had its main artery tied or obliterated, to regain all of its former powers; there will remain evidence of faulty nutrition for years, if not to the end of life.

An atheromatous condition of the arteries of the leg may lead to gangrene of the foot; and it is not generally wise to amputate in such cases, unless the surgeon goes high enough to render it comparatively sure that he is dividing the tissues above the diseased points in the artery. If an amputation be performed, and no blood flows from the divided arteries, it is pretty certain that the division of tissues is not high enough; and progress of the gangrene may be looked for, unless the amputation is executed at a higher point.

It requires close scrutiny in an autopsical examination to detect atheromatous deposits in an artery. In the earlier stages of the disease a delicate pellicle is deposited on the inner surface of an arterial trunk; and this can scarcely be distinguished from the natural lining membrane of the vessel. The adventitious structure seems to be a deposit from the blood, and not an exudation from capillaries ramifying the inner coat of the vessel. One layer after another is deposited until the calibre of the artery is substantially reduced, or entirely obliterated. The atheromatous deposits are pulpy and friable in the earlier stages of the disease, but become transformed at a later stage into fatty matter, or infiltrated with cretaceous material. During the progress of atheroma the artery feels hard in places, and the pulse fails to impart to the fingers that fullness and softness peculiar to a throbbing artery in a state of health. In advanced stages of the disease, after calcareous deposits have made the vessel knobby, a state of ossification is reached, which is one of the sequences of atheroma. Another prominent form of the disease, or another termination of it, is that of fatty degeneration, oily matter predominating in the atheromatous deposit.

The aorta is often the first artery impressed, and it may be years before the arteries of the limbs have more than isolated patches, yet the disease is progressive, so that sooner or later all the larger trunks of the arterial system will become more or less affected. It is not common for the disease to proceed continuously along a vessel, but sections here and there become impressed, and certain spots may wholly resist the encroachments of the morbid action. The arteries of the stomach, liver, and intestines, are remarkably exempt from the affection, while those of the lower extremities are as notably prone to the disease.

Atheromatous affections are rarely observed in persons under fifty, but are not uncommon in those who are evidently declining whether advanced life be attained or not. The gouty, the rheumatic, and those persons whose tissues are imbued with fat, and those whose excretory organs fail to purify the blood, are particularly prone to the disease.

Atheromatous arteries are liable to aneurism; and as the disease affects the vessel at a distance from the tumor, ligation is likely to prove disastrous. If the surgeon could determine in advance where there was a sound place in the vessel, he could enter upon the operation with confidence, but demoralized by doubt and distrust he often turns away from the operative procedure when a good result is possible.

Atheromatous masses in the aorta and large vessels may become detached from the place where they were originally deposited, and after being carried along in the arterial currents to the bifurcation of a vessel, they lodge, and thus plug the vessel in which the mass strands. Fibrinous clots from the cavities of the heart may be driven out, and in their course lodge, and effect the occlusion of a large arterial trunk.

Cases are recorded in which the brachial and femoral arteries have been occluded by the stranding of detached masses of atheromatous material, as was known by the sudden arrest of pulsation in the limbs, and a subsequent re-establishment of the circulation by collateral circuits.

In some of those cases of cold, withered, and dusky extremities so often noticed in persons somewhat adipose and advanced in life, the cause may be referred to atheroma of the arteries. Such persons are usually short-breathed, and pass for victims to some form of heart disease. In most instances there is a cardiac affection, which may have been the earliest manifestation of the morbid action.

ANEURISM.

A tumor containing blood and communicating with the cavity of an artery is called an aneurism; and when an artery is dilated to an extent that the blood currents make a whizzing sound in passing, the vessel is in an aneurismal state. The former condition is called *true* aneurism, and it embraces by far the greater number of cases. In this form of the disease the tumor is a single cyst, and limited to a well defined point in the artery; while in the latter, the whole circumference of the artery for a considerable distance has yielded to the force of the circulation, and the coats of the vessel are thinned and probably atheromatous.

A variety of aneurism not uncommon is one in which all the coats of the artery give way, and the blood is effused into the cellular tissue. In this case the adjacent anatomical structures form a barrier to the extension of the tumor, and the cellular tissue in a condensed state, forms a sac that helps to restrain the growth of the aneurism. This morbid state of an artery constitutes what has been usually described as a *consecutive* aneurism; and is not *diffused* as in the event of a *ruptured* aneurism, in which the blood is poured into the areolar tissue, to flow where it may, and no sac is formed.

An aneurism which forms without a known cause is called *spontaneous*, while one which succeeds an injury is denominated *traumatic;* yet neither is a distinct variety, and either is to be treated in the same way the other is. There is little propriety in multiplying terms to express unimportant phases or peculiarities in disease, unless something can be gained in the treatment. As a general thing, refinements in nomenclature serve to dazzle rather than to illuminate.

It has been observed that an individual who has a spontaneous aneurism is more likely to have several than a person who has none, which indicates that the disease is not wholly accidental, but comes through some defect in the coats of arteries. Broca cites several parties who had multiple aneurisms—a patient under the care of Pelleton had sixty-three.

The abuse of ardent spirits weakens the coats of arteries, and begets irregularity in the circulation, therefore it is put down as an exciting cause of aneurism. Atheroma is a predisposing cause of an aneurismal state of the arterial system.

Certain arteries are more liable to aneurism than others; the aorta is oftenest affected, the carotid second, and the popliteal stands third in the order of frequency. It is thought that forcible flexion of the knee is a provocative of popliteal aneurism, yet those who have been subjected to extreme flexion of the leg have not suffered oftener than those who rarely have the leg forced upon the ham.

The pressure of an exostosis upon an artery is prone to weaken the walls of the vessel, and thus to favor the formation of aneurism; and an abscess, through pressure or ulceration, or both, has been known to produce aneurism. An artery grazed by a bullet or bird-shot is liable to become aneurismal. Mr. Lippincot, of this city, has had an aneurism of one of the branches of the facial artery which was caused by the action of a bird-shot. The tumor is as large as a chestnut and has a bruit which disturbs him at night and when stillness prevails. I have seen an aneurism of the dorsalis pedis which was caused by the puncture of a spiculum of glass. The unfortunate use of the lancet near the elbow has frequently produced aneurism of the brachial artery.

Great mental shock has been followed by aneurism of the abdominal aorta. Mr. Rendle, Surgeon to Brixton prison, mentions two women who upon receiving the sentence of transportation from England, immediately sank with severe pain in the epigastrium, and soon manifested aneurism of the aorta, from which one of them died in forty-eight hours.

In two cases of aneurism of the aorta which burst and proved suddenly fatal, I have held autopsies. In both cases the pressure of the tumor caused absorption of the bodies of several adjacent vertebræ, but not of the intervertebral substance; and I conjectured that the salient projection of the intervertebral material had hastened the rupture of the aneurisms—one tumor was above the diaphragm, and the other below that structure. An aneurism of the subclavian artery has been known to cause absorption of a considerable portion of the first rib.

The termination of aneurism is so frequently fatal that any phase of the disease is looked upon with dread. Although layers of fibrinous material form on the inside of an aneurismal tumor, and make its walls thicker and thicker, the force of the vascular currents within tends to dilate and enlarge the tumefied mass, so that while there may be some gain in the deposit of what constitutes a barrier to the developmont or rupture of the tumor, there is also a loss to be sustained in the way of expansion and devitalization. The size of the tumor alone becomes destructive through mechanical pressure and the obstruction of functions, to say nothing of the general disturbance which is often observed to attend the growth and career of an aneurism. Suffocation is not an uncommon sequence of aneurism of the cervical and thoracic arteries; and deglutition may be impeded or interrupted by the same causes. A growing aneurism of the abdominal arteries may obstruct the intestinal canal, and seriously interfere with the functions of the ventral viscera.

Veins are often obliterated by the pressure of aneurismal tumors, nerves are absorbed, muscles wasted, and glands atrophied; and every step in the progress of the disease lessens the recuperative powers of the organism.

The inflammatory action provoked by the pressure of an aneurismal tumor occasionally leads to abscess and sloughing; and the softening process which attends the suppurative act, makes room for increased dilatation, or removes the support which has proved a barrier against rupture of the sac and fatal hemorrhage.

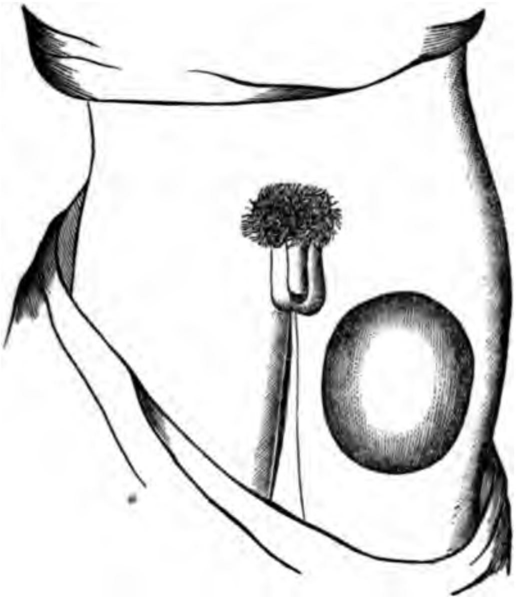
The bursting of an aneurismal tumor and the discharge of blood into the thoracic and abdominal cavities can not fail to be rapidly fatal through loss of blood from the circulatory system, and the shock imparted to the nerve-centers. Sometimes the patient, after such an occurrence, only draws a few expiring gasps which denote that death is not instantaneous. Occasionally a ruptured aneurismal sac will bleed for awhile, then the rent gets temporarily plugged; but a recurrence of the hemorrhage may be expected, the fatal issue having been accidentally postponed. In rare cases a rupture of the sac will, after bleeding to syncope, become permanently plugged by a clot of blood; and the coagulum may extend into the cavity of the sac and fill it; thus establishing a permanent cure.

Since aneurism is a disease which consists in disturbance of the natural equilibrium existing between the force of the circulation and the elastic reaction of the arterial walls at the part affected, and inasmuch as the blood in the aneurismal sac shows a tendency to coagulate when the full force of the circulation is diminished, it follows that the disease is capable of spontaneous cure in favorable cases. If the coagula in contact with the lining of the sac acquire organic connection with it, they will strengthen it, and enable the walls of the tumor to resist the impulse of the blood; the coagulating process not only checks the progress of the disease, but it may go on and fill the sac with solid fibrin.

Another method of spontaneous cure, besides the one by a gradual filling the sac with coagulable material, is by detachment of a fibrinous mass from the inside sac and its lodgment in the aperture which leads into the cavity of the tumor. The plug may not completely close the orifice at first, but if it sticks and maintains its position, deposits of fresh fibrin will seal the crevices, and thus force the circulation through collateral arteries.

That there is a strong tendency to spontaneous cure in aneurismal tumors is proven by the fact that few are found which have no laminated clot on their inner walls. An unfortunate circumstance in the operation is that the blood currents are too strong in places for the laminating process, hence there will be weak spots in the barrier, which either burst or yield to the expansive forces.

FIG. 51.



Aneurism of the femoral artery.

Holmes, in his *System of Surgery*, advocates absolute rest and a scanty diet, as favoring the spontaneous cure of aneurism. He says: "A man was admitted into hospital with a tubular (fusiform) aneurism of the femoral artery, unaccompanied by bruit or affection of the pulse in the lower part of the limb. The tumor was of a year's standing; it was compressible, and could be emptied of its contents. A plaster and bandage were applied, but not so firmly as to produce much pressure, and he was put to bed.

A good deal of pain was felt under the plaster for half an hour. It was left on for five days, and at the end of that time the tumor was found solid, and pulsation had ceased in it and all the arteries of the limb, and the cure seemed complete."

The compression of an artery by some mechanical means, at a short distance from an aneurism on the cardiac side, slackens the force of the circulation in the tumor, and thereby favors coagulation. The forced flexion of a limb, when this can be made to arrest the flow of blood to an aneurism, is an excellent method of treatment. The forcible flexion of the leg on the thigh, and the thigh on the abdomen, has cured popliteal aneurism, as well as aneurism of the femoral artery.

Mr. Fergusson has reported cures from a manipulating plan of treatment—his idea being that the force of the fingers breaks up the coagulated fibrin, when a detached mass floats into the mouth of the cavity, and plugs the orifice. As the method is simple and sometimes effectual, it should be tried before other more dangerous means are put into practice.

Brasdor's plan of treating aneurisms is to apply pressure to the tumor with the expectation of slackening the circulation, and, perhaps, of detaching a clot which may float into the neck of the tumor, and occlude the orifice. The Irish surgeons, who have met with great success by employing modified compression, do not aim to entirely suspend the circulation, but to so far impede it that coagulation shall be favored. By so doing, a great amount of pain is avoided, as well as the dangers of sloughing.

Pott advocated amputation, when it was practicable, for the cure of aneurism; and although the method is now considered antiquated, cases occasionally occur in which it is the best means to employ.

Hodgson is an earnest champion of the ligature to arrest the circulation in the artery—a method which was established by Hunter; and at the present day, both in Europe and America, the plan seems to have more influential advocates than any other; though the dangers and difficulties attendant upon ligation often lead to the trial of other means, the use of the ligature being a *dernier resort.*

So many mistakes have occurred in the diagnosis of aneurismal tumors, that the most experienced diagnosticians can not be too careful in the examination of swellings which possibly may be aneurisms. In the majority of instances, an aneurism emits an audible whiz, whirr, or *bruit*. It is a rough, blowing sound, peculiar to an aneurism, therefore, when once heard, it can not be misunderstood. If the artery can be compressed with the finger on the cardiac side of the aneurism, the tumor will be observed to empty itself, and to gradually refill when the finger is removed. It is also to be borne in mind, while establishing a diagnosis, that the force of the pulse beyond an aneurismal tumor is less than upon the opposite side, where the vessel is normal; and the pulsation frequently has a rough and blowing sound, or bruit. Besides, the veins in the vicinity of the tumor appear distended, and the circulation in the region seems disturbed and excited.

When aneurism affects the aorta in the chest or abdomen, the tumor can not be manipulated, therefore its diagnosis is more uncertain. However, if the bruit can be distinctly felt or heard, the existence of aneurismal action is determined, though it may not be easy to name the particular vessel implicated. The artery above the tumor can not be compressed, so as to discover the emptying of the aneurism, and its refilling when the pressure is removed. When the bruit is absent, in cases of suspected thoracic and abdominal aneurisms, a conclusive diagnosis can not be reached during the lifetime of the patient. If a pulsating tumor be discovered it is not certain that aneurism exists, for a tumor of any kind, in proximity with an artery, may have pulsatile throbs communicated to it. When an abscess rests against an artery the tumor may pulsate with a wave-like stroke, which closely resembles that of an aneurism.

Too much caution can not be exercised in the diagnosis of tumors in the immediate vicinity of large arteries. Broca states that the four successive senior surgeons of Hotel Dieu, viz., Ferraud, Desault, Pelletan, and Dupuytren, each by mistake opened an aneurism for an abscess. Mr. Liston once committed the same error, as also did Pirogoff; and the obscurity attached to the diagnosis of many diseases will lead to a repetition of such mistakes through all time. Billroth says: "Errors have been made even by experienced surgeons, at times when they did not think of the possibility of an aneurism, and were hasty. For, when the surrounding parts are much inflamed, the aneurism may be greatly masked by the swelling; it may be taken for a simple inflammatory swelling or abscess; it may have originated from an abscess. The latter mistake is the most frequent; it is punctured, and—what a disagreeable surprise!—instead of pus we have a stream of arterial blood. There is nothing at hand to arrest the hemorrhage; the situation is shocking, even if the surgeon have presence of mind enough to make instantaneous compression till he decides what next to do."

In May, 1874, I was called to examine the neck of Mrs. Bristler, of Covington, Ky. She had a tumor as large as the fist on the right side of the thyroid gland. I looked for the signs of aneurism, but found none that were conclusive. There was no bruit, the tumor could not be emptied by pressing on either side of it, and it could seemingly be made to move independently of the carotid artery, though this point was not clear. I sent an exploring needle into it, but got no evidence of its true character; and concluded it was cystic disease of the thyroid gland, as the tumor could not be separated from that body. In August I examined the tumor again, and punctured it with an exploring needle, but could not find evidence to overturn my previous opinion. The tumor was growing slowly, and I promised to operate upon it when the weather was cooler. Accordingly, in September, I invited Prof. Locke and Dr. Broyer to assist me in the proposed removal of the tumor. After chloroform was administered, I made an incision an inch and a half long over the top of the swelling, and to the depth of the skin and superficial fascias. I then pressed my finger between the tumor and the thyroid gland, to ascertain what connection, if any, existed between them. While carefully manipulating the parts, the tumor burst, and the blood spouted to the ceiling. Instantaneously I closed the wound snugly with my fingers, and called for two pairs of vulsellum forceps which had been laid near at hand for emergencies. These were made to supplant my fingers in the grasping process, and were more reliable holders. I then closed the wound with silver sutures, which were made to transfix the skin, fascias, and aneurismal walls deeper than the forceps grasped; and with twists of the ends snug fastenings were secured. No more blood than constituted the startling gush was lost, yet the patient was ghastly pale and vitally depressed. Re-action did not fully come on till next morning, yet from that time the recovery advanced satisfactorily, no threatening or untoward symptom intervening. On the tenth day the ligatures were cut away, and the reparation was sufficiently complete to be trusted with confidence. The swelling attendant upon the operation made the tumor appear larger than ever for awhile; but in the course of a month the tumefaction had so far subsided that the neck of the patient was smaller than before the operation, though there are at this time, a year after the *contretemps*, indications of a radical cure of the aneurism. The patient suffers no inconvenience from the tumor, and the general health is better than it was before the operation. The color of her lips is less purple, and the general circulation is more vigorous. The aneurism was of the right primitive carotid artery, in the middle of its course.

The treatment of aneurism by ligature was first practiced by Antyllus, but has been superseded by safer and more successful means. He commanded the circulation by compression while opening and emptying the tumor of fibrinous coagula; then he ligated the vessel on each side of the patulous aneurismal sac. Probably it would be safer and easier to treat a gluteal aneurism by this method than to ligate the internal iliac, an operation which is attended with much hazard.

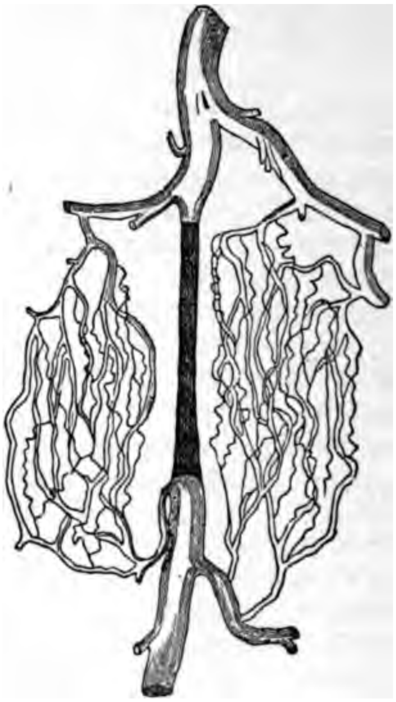
Hunter established the plan of ligating the artery on the cardiac side of the aneurism, and thus brought a previously intractable disease within the pale of the manageable of surgical affections. By this method the blood is prevented from entering the tumor, except to a moderate extent from collateral circulation. This gives the aneurismal sac an opportunity to fill with firm coagula, which afterwards may be removed to a considerable extent by absorption. The limb is vitally sustained and nourished by the free anastomoses of collateral vessels, so that gangrene of the extremity rarely occurs. If the femoral artery be tied some distance below the origin of the profunda, to cure popliteal aneurism, the blood will distend this artery and its branches, amongst others the external circumflex and its descending branch; which, joining with the superior external articular, and thus with the anastomotica magna, will be one of the arteries to convey the blood round the ligature back into the trunk of the femoral, below the obliterated spot. The number of such collateral arches of anastomis is uncertain, but probably they are numerous in most cases, and include vessels so minute in the normal state that they fail to receive an injection when a body is prepared for dissection.

The restoration of the circulation after a ligature is placed on the main trunk, begins at once, but does not attain its maximum for several months. Anel relates a case in which pulsation was

appreciable in the wrist the day after ligature of the bra
In another case, after ligation of the subclavian, pulse wa
in the wrist on the fifth day; but these have been consi
extraordinary cases. In the lower extremity the restorati
occasionally so slow that gangrene supervenes.

It is not uncommon for a limb which has had its main a
tied, to become temporarily paralyzed, and to continue in a
feeble state, and even to undergo an observable degree of
phy. In such cases the nerves of the limb may have bee
jured, though impaired nutrition will account for the enfe
state.

FIG. 52.



Collateral circulation shown.

According to tables drawn up to exhibit the rate of mor
after ligation of the main arteries of limbs, it would seem
the operation is nearly as fatal as amputation, the deaths o
ring mostly from gangrene and secondary hemorrhage. At
matous subjects better undergo amputation than risk ligatio
diseased arteries are extremely liable to secondary hemorr
Gangrene can often be prevented by keeping up the temper

of the limb by cotton and wool wrappings and artificial heat. The unnaturally high temperature which has been known to immediately follow ligation of the femoral is not to be taken as evidence that full collateral circulation has been established, for the unusual heat does not come from vascular activity, but through congestion and chemical changes in the incarcerated blood; and in case of coldness in the extremities too much artificial heat should not be employed, for gangrene has followed the use of hot salt and sand-bags to the limb. As near the natural temperature as possible should be maintained.

Ligature of an artery for the cure of aneurism is, according to the best authorities, not justifiable until other means of cure have failed, or all other means are impracticable. Injected arteries in the dissecting-room are easily reached by the rules laid down for such operations, but in the living subject, when considerable distortion or displacement of the tissues is occasioned by the proximity of an aneurismal tumor, the vessels are not so easily cut upon and ligated. However, when ligature of an artery is necessitated as the only means of saving life, the surgeon is not to be deterred from his duty by the dangers, difficulties, perplexities, and responsibilities of the operation.

Mechanical Compression.—The treatment of aneurism by digital and instrumental compression is about as old as that by ligation; and it has had its periods of popularity and disrepute. The modern method of conducting a course of treatment by compression is to employ such means as will lessen the force of the circulation through the aneurism during a considerable part of each day, and although benefit is not to be looked for at once, a change for the better may be expected in the course of a few weeks. The spontaneous cure of aneurism is usually by the deposition of laminated clots of fibrine on the inside of the tumor, the process of cure being gradual; and the recent manner of applying pressure is in imitation of a natural process which has been observed. By restraining the circulation in the artery leading to an aneurismal tumor, an opportunity is afforded for laminated clots to form; and when the process of coagulation is once begun it is likely to keep on until the aneurismal sac is filled and a permanent cure established.

Dr. Bellingham, a Dublin surgeon, in his work on aneurism, has shown that the treatment of the disease by compression, has been followed by the most flattering results. In some cases a cure was affected in a few days; and the means rarely failed. In England the success was not so marked, though a large percentage of cures were brought about by some kind of compression; and Mr. Hutchinson remarked that "all the success obtained by this method is clear and unbalanced gain—that in the cases which succeed, the patient is, with no appreciable danger to life, withdrawn from the various risks of the Hunterian operation, and in those that fail the dangers of ligation are diminished."

Instruments to effect compression are made on the principle of exerting pressure upon a small space, without any circular constriction of the limb. If a popliteal aneurism is to be treated the compressor consists of a metallic plate moulded like a trough, to rest on the thigh at a point opposite to the artery, and a pad supported on this plate by a strong lever, or arm, and movable in all directions. The lever stands well away from the thigh, and the instrument is kept in position by the compression it exercises.' When applied, it is screwed down upon the artery until the sensation communicated by the aneurism to the hand is considerably lessened and otherwise modified; and it is then left until the patient complains of pain. It is not necessary to arrest pulsation in the sac, an effect that might prove damaging; but it is best to commence with mild pressure, and frequently change the place of application. Generally it is enough to exert compression at intervals during the day, the patient having the entire night for repose.

I once cured an aneurism of the temporal artery by the application of a compressing force on the distal side of the tumor by means of an instrument shaped somewhat like a truss-spring and pad. The compressor was used about three weeks, when, all at once, the bruit, which had been exceedingly annoying to the patient from its proximity to the ear, ceased and never returned.

I have recently cured an aneurism of the brachial by the use of an elastic bandage, like that of Esmarch. The bandage was applied from the fingers to the shoulder every day for a week, the patient enduring the constriction for two hours at a time without discomfort or inconvenience. On the seventh day the bruit was lost, and the tumor had considerably diminished in size.

The carotids can not well be compressed without interfering with respiration and deglutition, to say nothing of the effects of pressure upon important veins and nerves. Digital compression is best endured, but none but professional hands are skilled enough to be risked. The effort should be steadily maintained for several minutes at a time, and few persons have the endurance to press steadily for more than a minute or two.

The subclavian artery can be pressed by means of a horse-shoe tourniquet, the counter-pad taking its bearing on the scapula. However, few patients have the heroism to endure much pressure in the root of the neck for a prolonged period. Besides, the vessel lies so deep that the pad has to press quite hard to even impede the circulation.

The abdominal aorta may be compressed sufficiently to arrest the circulation in an aneurism of the iliacs, yet few successes have been reported. Ligation of the external iliac has cured aneurism of the femoral near Poupart's ligament; and ligature of the primitive iliac is generally the best plan of treating aneurism of the internal iliac. Few patients will endure compression of any of the iliac arteries.

In July, 1856, a female patient came under the care of Prof. Gioppi, of Padua, the subject of aneurism of the ophthalmic artery; the case is reported as being very severe. The pulsating tumor could be felt by introducing the finger between the globe of the eye and the roof of the orbit; the bruit could be distinctly heard as well as felt. The carotid was compressed digitally for periods of a minute or two, and at frequent intervals. Pressure continued for more than a minute produced fainting. Nevertheless, at the expiration of one day visible improvement was perceptible, and at the end of four days all pulsations had ceased. A second case of formidable aneurism of the ophthalmic artery was cured, according to Vanzetti, by digital compression of the carotid. Intermittent efforts of five minutes each, through a period of eighteen days of treatment, and seven hours and twenty minutes of actual compression, effected a cure.

Prolonged flexion of the fore-arm maintained by adhesive strips has cured aneurism of the radial and ulnar arteries, and of the brachial near the elbow; similar treatment of the leg and thigh has been followed by cures of aneurisms of the lower extremity. However, if the flexion do not arrest the pulsation and the bruit, other means should be employed.

Successful treatment of aneurism is reported as having been brought about by the use of needles and galvanism, but it is not improbable that the presence of the needles in the sac produced the clot, for the introduction of horse-hair and other centres of coagulation, have effected as much. Transfixing an aneurismal tumor with a long slender needle armed with fine silver wire, in several directions, and then using the ends to distort and compress the sac, might bring about a cure, after which the wires could be removed.

The injection of aneurisms with coagulating liquids, such as solutions of the salts of iron, is a dangerous proceeding, the risk coming from the effects of the coagulating material in the circulation, and from suppurative action provoked by the presence of iron in the tissues.

Traumatic Aneurism is so called because an artery has become aneurismal through some injury inflicted in connection with an external wound or structural lesion, as in complicated fracture. A penetrating or incised wound which reaches an artery and perforates its walls, may seem to be a simple affair and create no apprehension of future trouble, doing well at first, but in the course of weeks or months a degree of tumefaction may appear at the seat of injury, and anomalous sensations in the region may be felt, such as cold, numbness, tingling, and a feeling of weight or stiffness which can not be accounted for, yet the discovery of a pulsating tumor beneath the scar of the wound declares the seriousness of the disease—a traumatic aneurism asserts itself. When the hemorrhage is considerable at the time the wounding takes place, and the bleeding is easily controlled by a compress and bandage, no subsequent trouble is generally suspected; but the blood may not have had a direct exit through the skin-wound on account of a change in the positions of fascias and other structures; and the bleeding may have been restricted to areolar and intermuscular spaces. Now, a sac might readily form in the boundaries of the extravasated blood, and a communication with the artery exist, and this would become an aneurism not differing essentially from one of the spontaneous variety. The bruit will positively declare the nature of the difficulty; and any particular enlargement of the tumor will indicate its danger.

Traumatic aneurism of the kind described may exist for years without progression or serious annoyance; and as the cause is local, and not generally of the heart and arteries, as in spontaneous aneurism, the disease is not especially dangerous. Compression or ligature of the artery leading to the tumor is likely to be followed by a cure.

When aneurism makes its appearance soon after a fracture, a splinter of bone having pricked or injured an artery, it is generally best to amputate, as the tumor is apt to interfere with the reparative process—pseudarthrosis and other difficulties resulting. However, it might not be expedient to amputate at once, but to dress the limb as the fracture demanded, and wait a few days to see if the efforts of nature might not heal the artery. Cases treated as if no aneurism existed have turned out well; yet the surgeon should from day to day scrutinize the condition of the limb, and amputate as soon as a gangrenous state or other pressing circumstances demand such an operative procedure.

THE LIGATION OF ARTERIES.

Few operations in surgery require the general and special anatomical knowledge as is demanded in the ligation of arteries; the general knowledge pertains to the relation of the large vessels to the skeleton and other prominent structures; and the special knowledge has to do with a lean or adipose condition of the subject, with pathological states, and with anastomoses by which the circulation may be restored. The location and general course of an artery can be ascertained by referring to a chart of the vascular system, but the immediate surroundings of a vessel can not be understood without an intimate acquaintance with practical anatomy obtained in the dissecting-room. The beginner should have the arteries injected with plaster or some firm material, in order that he may strike a vessel at once, and become familiar with its position and relations; he should then cut for arteries in an uninjected subject that he may learn to observe more critically the rallying points as well as the minute anatomy of the region. Important nerves and veins usually accompany large arteries, therefore their course and relations should be carefully learned. Certain muscles are often prominent guides to an artery, consequently such references, when they exist, should be studied with that particular object in view. By placing the body in various attitudes certain eminences and depressions may be made to answer as land-marks in establishing the situations of arteries. Attitude, or the position of a limb, may be rendered serviceable in bringing an artery nearer the skin or into a location favorable to an operation.

It is generally not best to ligate an artery just beyond a large branch, as the flow of blood prevents the formation of a long and firm clot between the ligature and the current leaving the main trunk. Probably the vessel crushed by a ligature becomes sealed by the organization of exuded lymph, which acts as a barrier to secondary hemorrhage when the ligature comes away, yet the barrier is strengthened by the presence of a long coagulum.

In disecting down upon an artery the edge of the knife is not to be freely used except to incise the skin, and to divide the fascias as they are raised upon a grooved director. The handle of the scalpel is a convenient implement to separate the yielding structures which may be met in the process of opening a way to the artery; and the grooved director is another instrument which can be used to advantage in parting loose textures. While the dissection is going on a wet sponge is to be used to mop away the blood and to arrest oozing or bleeding from small vessels. No artery requiring a ligature is likely to be sprung while the dissection is being executed. Pressure with the finger for a minute or two will stop a troublesome flow of blood. As the artery to be ligated is approached the finger will discover its pulsations, and thereby indicate in what direction the finishing touches are to be made. Most large arteries run in a sheath of fascia, which also contains the accompanying vein or veins. Should the artery sought lie deep, the edges of the wound must be drawn apart by retractors in the hands of an assistant. The fascia may then be raised at a convenient place with toothed forceps, and a slit made in it with scissors or the point of a knife; a grooved director is run through the incision, and made to raise the fascia so it may be divided to the extent of half an inch or more. Now the position of the vein must be considered in order that the aneurismal needle may be passed without danger of puncturing its walls; and as the needle is carried under the artery the vessel must not be lifted out of its bed, but carefully surrounded with the curve of the needle, the instrument being so directed that its point is entered between the vein and artery, yet turned away from the vein. After the loop of ligature appears in the eye of the needle, the artery having been underlaid, a blunt-hook, such as is employed in raising the tendon in an operation for strabismus, may be used to pull one end through; then, as the fingers hold the end, the needle may be withdrawn with the same care and gentleness that were exhibited in its entrance; but before the ends of the ligature are entwined in a knot, the parts to be involved in the ligature should be examined to see if the artery alone is embraced in the loop. The ligation is to be completed by making first a reef knot, or by putting one end under twice, so that it will not slip or yield when the knot is tightened. After the knot is drawn tight enough to crush the inner walls of the artery and to snugly pucker the outer coat, or in other words, after the vessel has been constricted so tightly that there may be danger of cutting the artery in twain, the second half knot is tied. One end of the ligature may be cut off within half an inch of the knot, and the other left for exerting traction in the event the ligature is slow to come away. The ligature may be constituted of silk, flax, cotton, or hemp. What ordinarily has been denominated saddler's silk, is the kind usually employed. A piece eighteen inches long, and well waxed, constitutes a common ligature.

The wound made for the purpose of effecting ligation is to be drawn together at its angles with adhesive strips, but an opening is to be left for the end of the ligature to protrude, and to facilitate drainage while the ligature remains, which will be from ten to twenty days. About fifteen days are usually occupied in the disengagement of the ligature. If it does not come away in twenty-five days, a smart jerk may be employed to effect disengagement. In this operation there is no danger of provoking secondary hemorrhage, as the main trunk, as a circulatory medium, is obliterated.

It is generally best to employ an anæsthetic before cutting for an artery, as the operation inflicts pain, and the patient is unsteady. The operator, too, does not feel in so much haste, if the patient does not feel any thing, or experience the passage of time. The incision is to be made along the course of the artery, or diagonally across the course of the vessel. The finger is used considerably while making way down to the artery, the pulsatory throb imparted to the exploring digit serving to locate the artery with exactitude. The frequent use of a sponge enables the surgeon to see what has been and what is to be done, and what may be the nature of a tissue raised with toothed forceps. However, an operator of experience knows so well the relative position of structures, that he proceeds rather boldly, without stopping to sponge the wound very often.

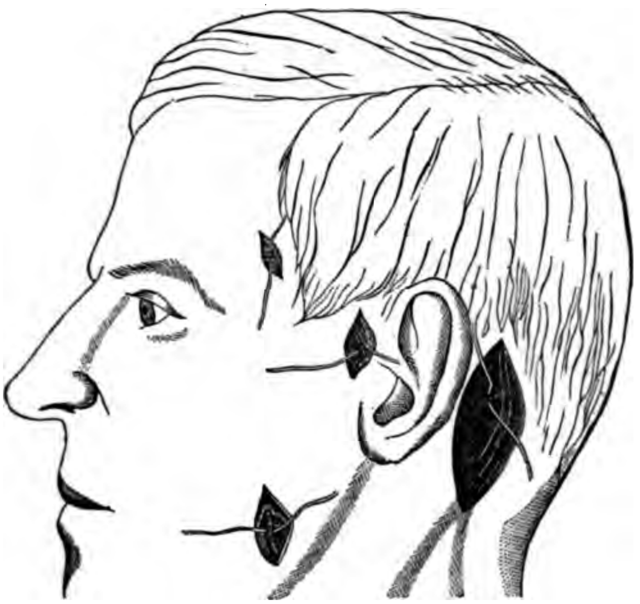
Aneurism of the Arteries of the Head and Face.—Aneurism of the cerebral and basilar arteries is beyond surgical interference. If a cure results, it is spontaneous, and not to be accredited to art, though means have been instituted to avert a fatal issue.

Temporal Artery.—The temporal artery may become aneurismal, yet the disease can generally be cured by compression—ligation being rarely required. The aneurismal condition may arise from an injury, or be of the cirsoid variety, the occipital and facial being involved. If ligation is deemed advisable, an incision three quarters of an inch in length, in front of the ear and parallel with the course of the vessel, will enable the operator to expose and isolate the artery, so that an aneurismal needle may be made to carry a ligature under it. When the tumor extends to the top of the parotid gland the ligature has to be placed so far below that the vessel will be found deep. In such a case the difficulty in reaching the artery is considerable, the density of the gland obstructing the procedure, and the blood obscuring it. And should the vessel be wounded, the placing of a ligature below the lesion is not easy and satisfactory. Ligature of the temporal artery as high as the top of the ear, is not attended with much difficulty.

Orbital Aneurism.—Aneurism situated within the orbit is usually cirsoid, or of the "anastomotic" variety. I have seen a case produced by a bird-shot, and several which have extended into the orbital cavity from nævi of the face. If the disease be anastomotic in character, it appears in early life, and comes on gradually. Aneurism of the ophthalmic artery is attended with loss of sight on the side affected, bulging of the eye-ball, swelling of the lids, and a bruit or souffle in the tumor. Pressure upon the carotid will generally suspend the latter symptoms. Digital compression of an intra-orbital aneurism has resulted in a cure, though in the majority of instances such a course would fail. As the artery is too deeply lodged in the orbital cavity to admit of ligation without removal of the eye, the necessity arises for ligating the common carotid on the affected side. The operation is severe, but after digital compression of the orbital structures has failed, the procedure is justifiable.

When aneurism of the ophthalmic artery arises within the cranial sinuses, its existence is inferred by a diminution of the ocular symptoms when pressure is made upon the carotid artery. The cerebral disturbance may indicate the nature of the disease, yet the production of similar symptoms from other causes renders the diagnosis obscure. When a bruit can be discovered in connection with a sawing noise heard by the patient, the nature of the disease is pretty well understood; yet mistakes have been made, even under such circumstances. A sharp crack recognized after the reception of a fall on the back of the head, diplopia, together with paralysis of the motor apparatus of the eye, have been regarded as additional evidence of aneurism of the ophthalmic artery.

FIG. 53.



Ligation of the temporal, facial, and occipital arteries.

Aneurism of the facial artery can generally be cured by compression, digital or otherwise, unless it be cirsoid, the arteries of the vicinity being enlarged and anastomotic. When a ligature is demanded, perhaps both facials may need tying; and as these vessels are quite superficial, especially where they pass over the base of the jaw, no special rules need be laid down for the operative procedure. An incision is made somewhat obliquely over the course of the vessel, and the thin muscular structures and fascias are raised on a grooved director, and then divided, until the bared artery is seen. The aneurismal needle facilitates the passage of the ligature, and saves disturbing the vessel in its bed.

Ligature of the facial in the submaxillary triangle below the gland, is a more difficult operation, though, fortunately not often necessitated.

Aneurism of the external or internal carotid artery, when it can not be cured by digital compression or mechanical means, is only amenable to the effects of a ligature placed upon the common carotid. In a lean subject, when the chin is raised and the head is turned to the side opposite to that to be examined, the artery can be seen pulsating at the anterior edge of the sterno-cleido-mastoid muscle, at the level of the cricoid cartilage, and the finger can feel its pulsations there. The vessel is here placed in the anterior superior cervical triangle, for it is above the crossing of the omo-hyoid muscle. The anterior edge of the sterno-mastoid muscle is the most valuable guide to the artery. Even in a fleshy individual the muscle can be felt, and distinctly seen when cut upon. To reach the common carotid at the most available point in its course, an incision two inches in length is to be made along the anterior edge of the muscle referred to, the center of the cut corresponding to the level of the cricoid cartilage. After the skin is divided the grooved director takes up the platysma myoides and the superficial fascia of the neck, and these structures are then incised. The red fibres of the sterno-mastoid muscle now being exposed and recognized, the anterior edge is pushed outwards a little with the scalpel handle, to disclose the pulsating artery which lies a little deeper and is yet covered by a layer of cervical fascia. The descendens noni nerve is seen upon the sheath of the carotid vessels, and may be held aside with a blunt hook while a pinch of the sheath is raised with forceps preparatory to making a nick in it for the entrance of the grooved director, on which the sheath is to be split to the distance of a half inch or so.

It is to be borne in mind, that the internal jugular vein is in the same sheath with the artery, and lies upon its outer side; and that the pneumogastric nerve is also in the common sheath, yet between and behind the vessels. The artery having been exposed and carefully cleared of cellular tissue, the aneurismal needle is carried from without inwards, the blunt point of the needle being kept close to the artery to avoid inflicting any harm to the internal jugular vein; and as the needle is slowly passing it must be remembered that keeping close to the artery is to escape including the pneumogastric nerve. The introduction and the withdrawal of the curve of the needle are to be conducted deliberately, to avoid disturbing the artery or adjacent vessels and nerves. After the ligature is tied, one end of it may be cut away, and the other left to make traction upon in the course of ten or fifteen days, when it is thought best to assist in the removal of the foreign body.

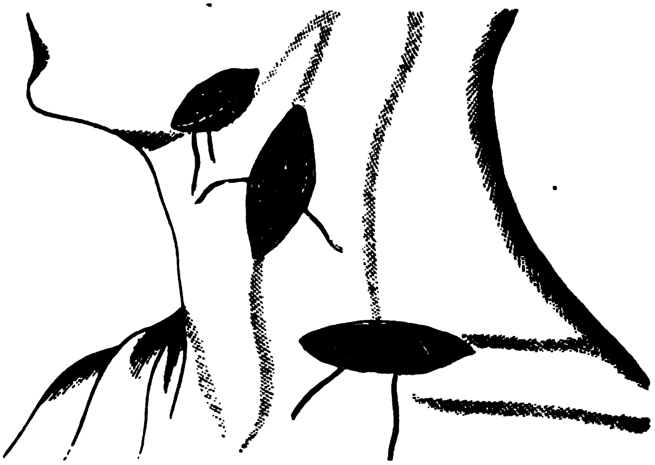
In cutting down upon the common carotid, it is to be remembered that if the descendens noni nerve is not seen upon the sheath of the vessels, it may be inside the sheath, where it would be in danger of being included in the ligature, unless the operator was on his guard against such an accident.

In the course of the dissection a small vessel may bleed sufficiently to obscure the parts sought. In that event it is best to ligate the bleeding trunk, or pinch it till the hemorrhage subsides. It is better to proceed slowly and with safety, than to risk much.

When the aneurism involves the upper extremity of the common carotid, the ligation is to be performed lower down, where the vessel lies deeper, and the guides to it are not so plain. The artery near the root of the neck is covered by the sterno-cleido-mastoid muscle, as well as by the sterno-hyoid and the sterno-thyroid muscles. After an incision is made over the course of the carotid, down to the muscles, the sterno-mastoid is to be cut crosswise for half its width, and then retractors are to be employed to make the wound gape. The grooved director, the handle of a scalpel, or some other blunt instrument, is to be used to break up the areolar tissue, to test the fascias, and to hunt for the artery. The thyroid veins usually lie in front of the artery, and on the left side of the neck the internal jugular inclines considerably to the front of the artery as it approaches the thorax. A finger in the wound discovers the location of the vessel by the pulsation. Besides, the finger feels the trachea on its inside a half inch or so, and the transverse processes of the vertebræ beneath or behind it. Great care must be exercised in opening the sheath of the artery, for the vessel itself can hardly be brought into view. On the right side, the innominate artery is near; and the ligature should not be placed nearer than half an inch of it.

The operation of tying the common carotid high up, or at the apices of the two great anterior cervical triangles, or at a point where the omo-hyoid muscle crosses, is not a difficult surgical procedure, but lower down the obstacles and dangers are increased. The fatality attending ligation of the common carotid artery reaches thirty-three per cent., which is formidable, yet of the cases tabulated it would seem that ligating for aneurism is not so fatal as tying to arrest traumatic hemorrhages, for security against hemorrhage in the removal of large tumors of the face, submaxillary, and parotid regions, and for the cure of erectile tumors of the orbit and scalp.

FIG. 54.



Ligation of the facial as it passes the jaw; of the common carotid; and of the left subclavian arteries.

The cause of death after ligature of the large arteries of the neck, is secondary hemorrhage; while the danger after ligating the large arteries of the extremities is gangrene. Ligature of both carotids at one time is found not more dangerous than separate ligations at intervals. When Allan Burns first tied both common carotids, he expected to see the patient collapse, but not a feature changed when the second ligature was tightened. The vertebral arteries carried all the blood needed to maintain the functions of the brain until free anastomosis was established. However, it is found that the ligation of one common carotid has been followed by unpleasant and even fatal consequences to the brain. Atrophy, gangrene, and softening of the cerebral mass, are the enumerated sequences of ligation of the carotids.

In wounds of arteries derived from the common carotid, occurring in inaccessible situations, it is usually better to tie the common carotid than to attempt a more difficult and dangerous operation. It is even better, in most instances, to ligate the main trunk, instead of the internal or external carotids, for aneurisms or wounds of those vessels. Cirsoid or anastomotic aneurisms of the branches of the external carotid are very common, but it is rarely justifiable to tie any vessel with the expectation of a permanent cure. The disease is progressive, therefore the ligation of both common carotids might result in a failure. In one case of the kind reported, the vertebral arteries kept up anastomotic connections until the establishment of collateral circulation in the superficial vessels of the neck revived the original disease.

Ligature of the Subclavian Artery.—The subclavian is tied to cut off blood from the axillary which is aneurismal, or, from having been wounded, is bleeding. When the operation is necessitated from the fact that tamponing the wound does no good in traumatic difficulties, and compression fails in aneurismal troubles, the patient is to be laid on the sound side; the arm depressed as far as practicable, in order to draw the clavicle out of the way of the artery; and then the skin of the neck is to be pulled down upon the chest by the fingers of the operator's left hand, while he makes an incision down to the bone along the prominent part of the clavicle, from the posterior edge of the sterno-cleido-mastoid to the anterior edge of the trapezius. The skin is now allowed to retract, when the incision will be seen above and parallel to the clavicle. This is to save cutting the external jugular vein, which dips below the clavicle. During the rest of the dissection the vein is drawn to one side with a blunt hook. As the wound is to be two inches in length, the edges of the two muscles just referred to will be incised to some extent. The artery lies deep in the subclavian triangle, and after the first incision already alluded to, the rest of the way to it is to be made with the finger, director, or other blunt instrument, scissors being employed to sever bands of fascia. Beneath the sterno-cleido-mastoid muscle, and at considerably greater depth, running almost parallel with the more superficial muscle, is the scalenus anticus muscle, which has its insertion in the first rib, at a tubercle that the finger can feel. The subclavian artery lies beneath this muscle, and its pulsations can be felt by the same finger that seeks the tubercle on the first rib. In the deep part of the subclavian triangle, are two branches of the thyroid axis, the transverse cervical and supra-scapular arteries; the veins accompanying them empty into the internal jugular. Also are there the brachial plexus of nerves, and a group of lymphatic glands; the latter, when enlarged, are obstacles in the way of reaching the artery. All of the vessels and nerves mentioned may not be seen, yet they are in the triangle.

When the artery is discovered, and its sheath is slit for a short distance, the aneurismal needle is carried around it from below upwards, great caution being exercised that the lowest cord of the brachial plexus of nerves be not embraced with the artery, or taken up instead of the vessel.

On the dead subject, if the cadaver be lean, it is neither difficult nor tedious to cut down and throw a ligature around the subclavian artery. But in the living subject, with a full neck, the operation is one of the most formidable in surgery. While the dissection is going on the artery lies at the bottom of a deep cavity liable to be filled with blood oozing from the many small vessels which get cut or torn in the operative procedure. The scalenus anticus muscle is the immediate guide to the artery, and should not be neglected by the operator.

Ligature of the subclavian frequently terminates in failure, accidents, and disaster. As expert a surgeon as Dupuytren forced the aneurismal needle through the vessel, and the ligature embraced one of the large nerves of the brachial plexus as well as half the artery. The operation lasted nearly two hours; and upon the death of the patient, four days afterwards, the blunder was discovered. Mr. Liston once threw the ligature around one of the nerves of the brachial plexus, and was about to tie it, when by feeling for the pulsations he discovered his mistake. Passing the ends of the ligature to an assistant, the cool operator said, "There, you hold that nerve out of the way while I seek the artery."

Dr. John C. Warren, of Boston, wounded the pleura while endeavoring to find the subclavian artery. He heard the air rush into the chest, but this circumstance did not deter him from finishing the operation; and the patient recovered.

The mortality attendant upon ligature of the subclavian artery is about forty per cent. Dr. Norris tabulates sixty-nine cases, thirty-three of which died. Since Norris' tables were published, others have been made up, but with no better showing for the operation. Dr. Mott ligated the subclavian artery within, or on the tracheal side of, the scaleni muscles, but like his cases of ligature of the innominata, all terminated fatally.

When the "subclavian triangle" is filled with an aneurismal condition of the artery, the vessel itself is so far involved that it can not be tied on the cardiac side of the tumor, but the innominata may be ligated when the aneurism is on the right side of the neck. The operation is not more difficult than that for ligation of the subclavian, but the fatality thus far attending the procedure offers little encouragement for repetitions.

The effect of cold and pressure has been successful occasionally in the treatment of subclavian aneurism, therefore ligation of the innominata, considering the dangers, may be regarded unjustifiable.

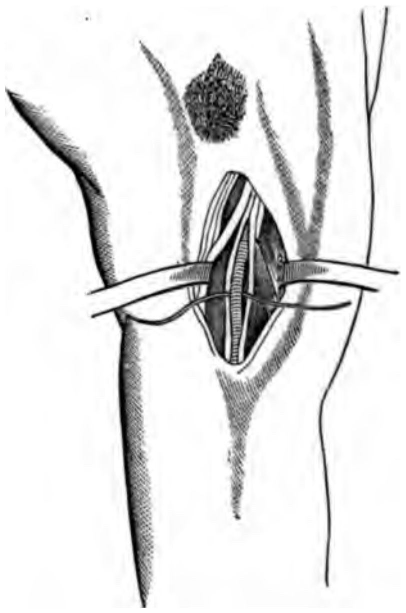
The difficulty in determining the extent of a large aneurism at the root of the neck, is often a hindrance to an operation. The lower end of the carotid, the inner extremity of the subclavian, and the innominata may be involved; and neither the bruit nor any other sign will decide just how far the dilatation and the atheromatous deposit extend. On the left side of the neck, the diagnosis may be less perplexing, yet even here the bruit and pulsatile vibration may affect the aorta and the heart itself. In the earlier stages of the disease, the tumefaction and abnormal sounds may be restricted or circumscribed to a space which will indicate the vessel affected and the extent of the aneurismal state, yet after the morbid action reaches over a space as large as the two fists, a part of the tumor being inside the thorax, the diagnostic points are not clear. Œdema of the arm, lividity of the tumefied parts, difficulty of breathing, and rapid growth of the tumor, are complications of a serious nature, and admit of little hope either in a spontaneous cure or in any kind of treatment. Ligature of the vessels on the distal side of the tumor (known as Brasdor's operation), is about the only procedure in which there is any hope, and in this there is but little.

Axillary Aneurism.—Aneurism of the axillary artery occurs from the stretching forces which are so often exerted by the extreme motions of the arm. The vessel is short and studded with branches, so that its ligation is rarely practicable. The loose tissue surrounding the artery allows of immense distension in a very short time, consequently the tumor is often formidable in size before the surgeon's attention is called to it. When the axillary is punctured or lacerated, the tumefaction beneath the clavicle and in the vicinity of the shoulder-joint is not essentially different from that belonging to aneurism, therefore much care must be exercised in the diagnosis of axillary tumors.

The Hunterian method which consists in ligaturing t
on the cardiac side of the tumor, is rarely practicabl
treatment of axillary aneurism unless the subclavian
and even that operation is as hazardous as to tempora
press the subclavian, and then perform the original ope
emptying the sac and ligating the vessel on both sid
tumor.

Digital or mechanical pressure upon the subclavian
cold and manipulation of the tumor, offer as reasonable
a cure in case of axillary aneurism, as any form of
therefore the surgeon should study every individual
estimate the dangers and prospects, before resorting to
of the subclavian.

FIG. 55.



Ligation of the axillary artery at its lower extremity, and of the brachial nea

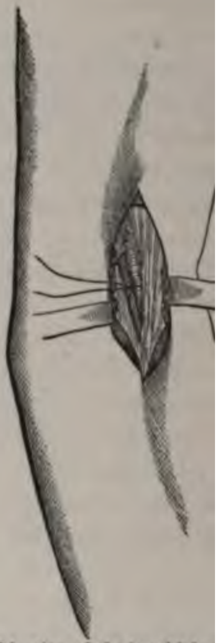
The Hunterian method of tying the axillary artery
rism or traumatism of the brachial, is not difficult if
can be reached in the lower part of its course. Whe
is carried away from the body, the axillary region is

posed; the distance between the prominences of the latissimus dorsi and the pectoralis major, is to be divided into three spaces, and where the anterior and middle spaces come together, is the place to be incised to find the artery. The skin and fascia are to be divided carefully for two inches or more parallel to the general course of the artery, and then the forearm is flexed upon the arm to relax the tense tissues. The deeper fascia is next raised and incised, when the axillary artery, partly covered with veins and nerves, may be found. The vein is to be pushed to one side to expose the artery which has the median nerve on its anterior side or towards the pectoral muscle, and the ulnar and internal cutaneous nerves on its posterior aspect. In the passage of the aneurismal needle great care must be exercised so as not to wound the axillary plexus of veins, nor to include any of the nerves.

Ligation of the axillary artery below the clavicle is apt to be followed by troublesome suppuration, but the axillary wound just described is thoroughly drained.

Ligature of the Brachial Artery.—The axillary artery becomes brachial at the termination of the axilla, or at the lower border of the latissimus dorsi and pectoralis major muscles, and the vessel keeps the new name until it reaches the bend of the elbow, or divides into the radial and ulnar arteries. The vessel may be tied at any part of its course, but a description of the operation in the middle of the arm will, with some modifications, answer for the operative procedure higher or lower. An incision two and a half inches in length, made along the inner margin of the biceps muscle, or of the coraco-brachialis higher up, will serve as a beginning in search of the vessel. In case of œdema the muscle is not externally well defined, but if a line be drawn from the middle of the arm-pit to the middle of the arm at the bend of the elbow, the course of the artery will be traced, and the muscle will be seen as the dissection progresses. The basilic vein is often in the way, but should be avoided. After the bundle of vessels and nerves is reached, the fascia which encloses the mass should be carefully opened by nicking it with a knife after a point is raised with toothed forceps, and a grooved director is used to separate that tissue from its contents. The internal cutaneous and ulnar nerves lie to the inner side of the artery, and may not be seen; the external cutaneous may be discovered on the outside of the vessels. The operation is not deep nor difficult, if the artery can be seen early isolated; but the areolar tissue binds the vessels and n together, and the artery dodges about in attempts to free it from its surroundings. The median nerve often rests upon the artery, and needs to be pulled to one side or the other in order to expose the vessel. Occasionally the radial and ulnar take their origin high up the arm, so that ligation of one trunk under the impression it be the brachial, would not arrest hemorrhage, nor stop the pulsation in an aneurism at the elbow, consequently failure to recognize the anomaly might lead to confusion or embarrassment. The venæ comites often entwine the artery so intricately that a freeing or cleaning of the vessel to be tied is exceedingly perplexing. After the aneurismal needle has placed the ligature around the artery, the knot should not be tied until a close inspection of the part has been made.

FIG. 56.



Ligation of the brachial n
elbow.

Ligature of the brachial has oftenest been performed to arterio-venous aneurism near the bend of the elbow—a di produced by a careless use of the lancet in phlebotomy. I ligation be successful the dangers from secondary hemorr and gangrene are not great. However, according to P tables, ten out of sixty-eight cases of ligature of the bra artery, proved fatal.

Low down the arm the aponeurosis of the biceps cover brachial artery, and has to be slit with care to expose the v without inflicting undue injury to the parts involved i wound. The biceps muscle is the guide to the artery fo whole length, though the coraco-brachialis is the best refe high up. Near the bend of the elbow the artery turns tow the middle of the anterior space, and inclines to get unde lower end of the biceps muscle.

Ligature of the Radial Artery.—It being a rule that spontaneous aneurisms diminish in frequency as vessels diminish in size, the radial artery will not often have to be tied except to arrest hemorrhage, or to cure a traumatic aneurism. Besides, digital compression will generally cure aneurism of the arteries of the forearm. In the upper third of the forearm, the radial artery rests in a groove that separates the supinator radii longus from the pronator radii teres and flexor carpi radialis muscles; and is covered by the skin, fascia, and inner edge of the supinator longus muscle. The artery, then, is reached by making an incision two inches long over the course of the vessel, and pulling outwards the edge of the supinator longus muscle. The sheath of the vessel is then seen, and is to be slit to allow the aneurismal needle to surround the vessel.

Every physician is familiar with the position of the radial just above the wrist where the pulsations of the vessel are felt to determine the character of the circulation in disease; and here the artery rarely has to be ligatured except to arrest hemorrhage from a wound of the palmar arches—the ulnar, on account of the free anastomosis, needing a ligature at the same time.

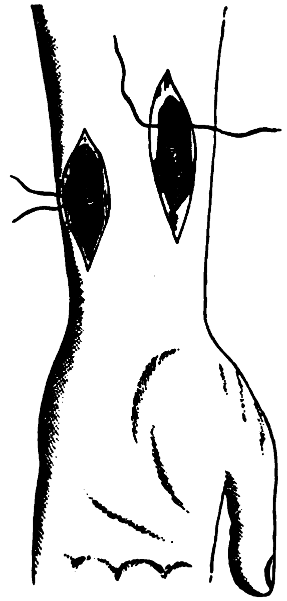
To reach the artery an incision two inches in length is to be made over the course of the vessel, and on the radial side of the tendon of the flexor carpi radialis muscle the artery is found, with the radial nerve on its outside. The sheath of the vessel is then raised, nicked, and opened on a director. The artery, when exposed, is easily encircled with a ligature and tied.

To ligate the ulnar artery high up, where it is covered by four of the muscles which arise from the inner condyle, is not an easy matter. Near the middle of its course the ligation may be accomplished with comparative ease. The vessel here lies upon the flexor profundus muscle, beween the flexor sublimis and the flexor carpi ulnaris muscles. The ulnar nerve is on the inner or ulnar side of the artery, therefore it is not difficult to find the vessel after an incision two inches in length is made over the course of the artery, and the space between the sublimis and ulnaris muscles is recognized. If the nerve be seen, and it generally will be, the artery can be found on the side towards the middle of the forearm. The pulsation of the vessel determines its character. The artery is in a muscular interspace, therefore in searching for it no muscle is to be lacerated. After the sheath of the vessel is raised and slit on a director, the aneurismal needle is to be passed from within outwards, the hand being flexed to relax the muscles.

Lower down, or near the wrist, the ulnar artery is still upon the profundus (tendons), and between the sublimis and the ulnaris, with the ulnar nerve on its radial side. An incision two inches long, made over the course of the artery, and through the skin and fascia, gives the operator an opportunity to search with a director or scalpel handle, for the tendonous interspace between the flexor sublimis and the flexor carpi ulnaris, where the artery rests. The sheath is split on a director, and the ligature passed as in the ligation of other vessels.

When explaining the ligation of arteries on the cadaver, I am in the habit of calling attention to the position of vessels by puncturing the arm with straight needles an inch or two apart. The row of needles indicates the course of the arteries; and when I afterwards cut for the vessels, they are generally found pierced by the needles. Injected arteries can commonly be felt before an incision is made, therefore the expert anatomist prefers to cut for an undistended vessel.

FIG. 57.

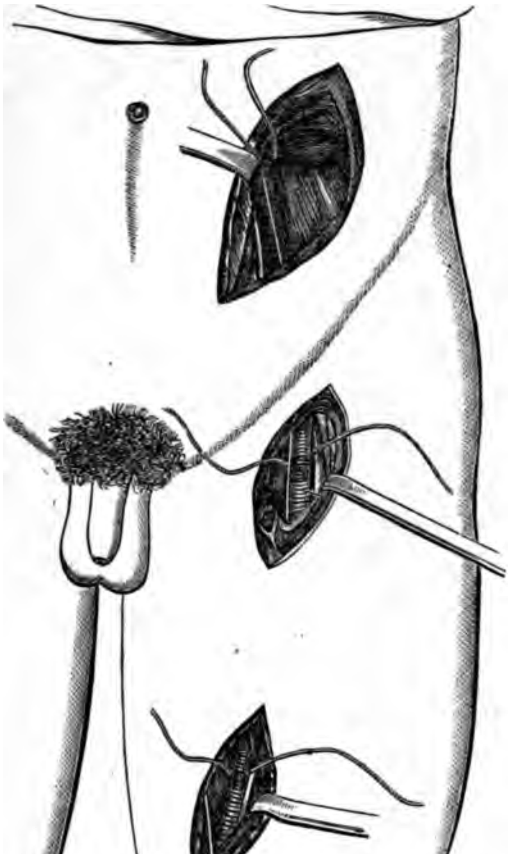


Ligation of the radial and ulnar arteries.

Ligature of the Aorta.—Aneurism attacks the large arteries oftener than the small, therefore the thoracic aorta, of all arteries, is the oftenest affected; but the size of the vessel and the difficulty of getting at it, forbid ligation. A patient with aneurism of the thoracic aorta is an object of commiseration—the tumor gradually increases in size, and the respiration grows more and more troublesome. To an enfeebled condition is added the certainty of a speedy death at any moment. The sword of Damocles is suspended by a hair, and though it may not fall, its descent is constantly expected. While death is so imminent, cases of recovery occasionally occur spontaneously. However, such an issue is so rare that little encouragement can be given to a patient with aneurism of the aorta; and no method of treatment yet devised promises the remotest hope of success.

Aneurism of the abdominal aorta is also fearfully fatal. In thin subjects the application of mechanical pressure may be endured long enough to provoke coagulation in the tumor.

FIG. 58.



Ligation of the primitive iliac; the femoral just below Poupart's ligament; and of the same vessel near its lower extremity.

Reduction of the force of the heart and arteries by the agency of veratrum or digitalis, together with cold locally applied, might favor coagulation and a cure. The Hunterian method of ligation is impracticable. The aorta has been tied just above the iliacs, but always with a fatal termination sooner or later.

Ligature of the Common Iliac Artery.—The operations for securing any of the iliac arteries are similar in most of their details. The same incision serves to reach them all—only the common iliac requires an incision which extends higher than one for securing the external iliac. The great depth of the internal iliac demands an incision as long as that for ligating the primitive trunk.

In applying a ligature to the common or primitive iliac, the situation of the accompanying veins is to be remembered; and the ureter is to be borne in mind, that no accident happen to it.

According to the report of Dr. Stephen Smith, which relates the cause of the operation, the common iliac had, in 1860, been tied thirty-two times, but only seven cases terminated in recovery. The artery was ligated eleven times for the arrest of hemorrhage on account of wounds, with only one recovery; fifteen times for aneurism, with ten deaths; four cases for pulsating tumors mistaken for aneurism, with one recovery; to obviate hemorrhage in an operation in one case, and in an aneurism by anastomosis in the second—two cases—both of which died.

The common iliac is to be tied by cutting through the abdominal walls, but not by going through the peritoneum. Sir P. Crampton was the first surgeon who successfully ligated this great vessel, therefore his description of the operative procedure is all the more interesting. He made an incision in the abdomen which reached from the last rib to the anterior superior spinous process of the ilium, touching the crest of that bone in the curvilinear sweep. The muscles and transversalis fascia were cut through at the bottom of the incision till the subperitoneal interval was reached, and then the peritoneum being held back by the front of the finger, a probe-pointed bistoury was run along the back of the finger, and so by repeated strokes of the knife the muscles were divided to the extent of the external wound. Sufficient room was thus obtained to pass in the whole hand, and raise the peritoneum and intestines from the fascia iliaca. "The parts were unobscured by a single drop of blood. There lay the great iliac artery, nearly as large as my finger, beating awfully, at the rate of 120 in a minute, its yellowish-white coat contrasting strongly with the dark blue of the iliac vein which lay beside it, and seemed nearly double its size. The ureter in its course to the bladder, lay like a white tape across the artery; but in the process of separating the peritoneum, it was raised with that membrane, to which it remained attached."

The abdominal wound made by Crampton was more extensive than it need to have been. By operations upon the cadaver it will be seen that a curved incision five inches in length, reaching from a point a little to one side of the umbilicus, downwards and outwards to the crest of the ilium, and then downwards and inwards to the middle of Poupart's ligament, will, when carried through the abdominal muscles and transversalis fascia, afford room to peel the peritoneum from the iliac fossa, and, by pressing that membrane inwards, expose the iliac vessels.

The common iliac veins usually lie behind the arteries, and a little farther inwards; and their position being that of contact, great care would be required in passing the aneurismal needle, and not wound the vein.

In ligation of the internal iliac, the greatest care is needed to avoid injuring the accompanying vein and other important structures. The vessel being within the pelvic cavity, the sense of sight is not so available in throwing a ligature around the artery as that of feeling—the fingers guiding the point of the needle while carrying the ligature.

The external iliac artery, of which the femoral is a continuance, can be ligated through a wound made not quite so high as that indicated for securing the common iliac. The incision may be commenced an inch or two below the umbilicus, and as far to one side of it, the semicircular sweep reaching not quite to the crest of the ilium, but to the middle of Poupart's ligament. If the artery is to be tied near its lower end, as it may be to arrest hemorrhage from the femoral, the incision may begin near the crest of the ilium, and extend not quite to the middle of Poupart's ligament. Having divided the abdominal muscles and the transversalis fascia, the peritoneum is separated from the iliac fossa, and pushed towards the pelvis; and on introducing the finger into the bottom of the wound, the artery may be felt pulsating along the inner border of the psoas muscle. The accompanying vein is situated along the inner side of the artery, and must be cautiously left undisturbed in the passage of the aneurismal needle from within outwards.

The circumflexa iliac artery and its branches may bleed considerably when divided, while making the incisions to reach the external iliac, but severed trunks of their size will not offer serino difficulty in the operation. A pinch and a twist made on a bleeding vessel will soon arrest the flowing blood; if not, a ligature may be used.

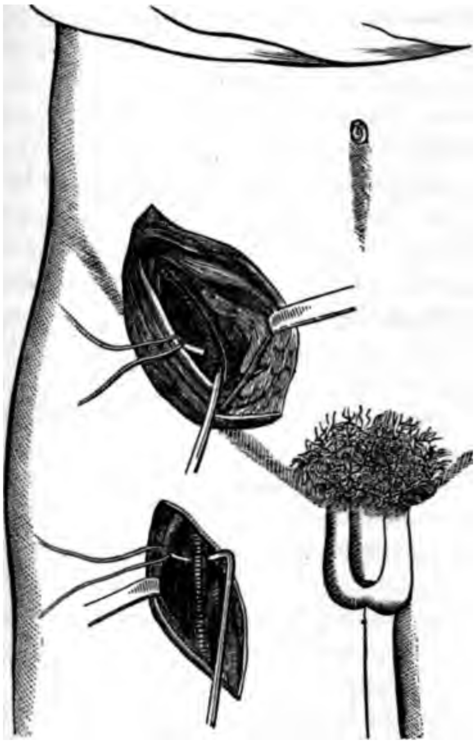
Ligature of the Femoral Artery.—The femoral artery is a continuation of the external iliac, and reaches from Poupart's ligament to the canal in the adductor magnus muscle, where it becomes popliteal. Its commencement in the femoral canal, beneath Poupart's ligament, is at a point about half way between the anterior superior spine of the ilium and the symphysis pubis. In its course down the thigh the vessel inclines to the inside of the thigh; so that a line drawn from its origin to the inner point of the inner condyle of the femur, would cover the position of the artery. In the upper third of the thigh, the femoral artery is comparatively superficial, being covered by the integument and by several layers of fascia, in which are the inguinal glands; it is contained in a well defined space, called "Scarpa's triangle." The space is bounded above by Poupart's ligament—the base of the triangle,— externally by the sartorius muscle, and internally by the adductor longus muscles. The femoral vein lies on the inner side of the artery, as the vessels emerge from beneath Poupart's ligament, and keeps to the inside until it reaches the apex of Scarpa's triangle, when the inclination is to get behind the artery. On the strong, fibrous sheath which encloses the femoral vessels rests the anterior crural nerve, or its branches.

From one to two inches below Poupart's ligament, the femoral on its outside gives off a very large branch, called the profunda femoris, the blood of which is mostly distributed to the thigh, while the true femoral conveys blood to the popliteal, and by its branches to the leg and foot. To tie the femoral *above* the profunda is to cut off the active circulation of the whole limb; while ligation of the femoral *below* the profunda is to prevent blood reaching the popliteal and its branches.

The femoral artery may be compressed, either digitally in amputations of the leg and thigh, or instrumentally for the cure of aneurism, the pressure being applied just below Poupart's ligament. At this point the vessel is superficial, and the firm structures beneath offer plenty of resistance, as the surgeon's thumb is pressed firmly upon the artery. The vessel can be compressed four or five inches lower down, either by digital or mechanical means. But the compression at this point is from within outwards, on account of the change in the position of the artery—the object

ompression being to temporarily occlude the vessel be-
e thumb, or pad of a tourniquet, and the bone.
hoicest place to ligate the femoral artery is below the
f the profunda, at the apex or lowest point of Scarpa's
At this place the vessel is superficial, and at a distance
e origin of any considerable branch. Besides, another
s in favor of this point, viz: the inner edge of the sarto-
cle is a reliable guide to the artery. Even in an œdem-
bject, the obliquely running fibres of the muscle, as soon
eached, are easily recognized, and indicate the location of
el.

FIG. 59.



ation of the external iliac; and of the femoral in Scarpa's triangle.

cision three or four inches in length, made parallel with
se of the artery, begins the operation; after the fascia
ached, that structure is to be raised with toothed forceps,
ith a knife, and split on a director to the full extent of
nd. This dissection exposes the sartorius muscle, under

abnormal displays would complicate an operation, and make it unusually dangerous.

The depth of the vessel near its lower end—at the canal of the adductor magnus muscle—is so great that there is difficulty in reaching it; and if reached and tied, the results have not been satisfactory. Hunter advocated the point as feasible for ligation of the femoral artery, but his successors have not met with a degree of success that warranted the step as a legitimate operation.

It is common now to treat popliteal aneurism by compression of the femoral artery, or by pressure directly applied to the tumor, therefore ligation of the femoral is not as frequent an operation as fifty years ago. In some cases genuflexion will cause the pulsations and bruit in a popliteal aneurism to cease. The flexion of the leg on the thigh should be snug, and long maintained by the use of adhesive strips, which are made to encircle the leg and thigh after they are brought into apposition.

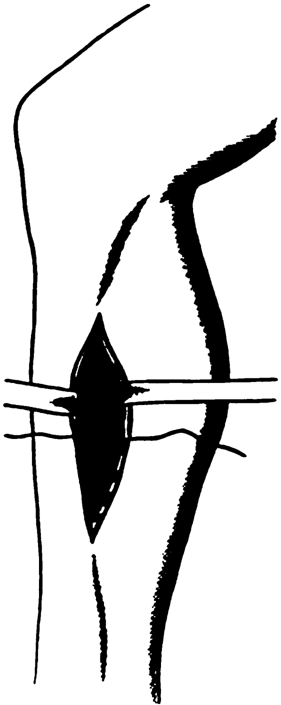
The popliteal artery, for reasons not easily explained, unless the hinge-like motion of the knee has something to do with it, is the vessel which frequently takes on an aneurismal state. The disease is discovered by pain and stiffness of the limb, by a pulsatile tumor in the popliteal space, and by the aneurismal bruit.

The popliteal artery is rarely if ever ligated, unless for wound or aneurism of the posterior tibial, and even with these traumatic and morbid complications, it is better to go higher and take the femoral. In the popliteal space the popliteal artery gives off numerous branches, and the vein with its branches, is in such intimate relations with the artery that ligation is impracticable.

Ligature of the Arteries of the Leg.—Spontaneous aneurism rarely affects the arteries of the leg, but wounds of the plantar arteries, and traumatic aneurism of the lower ends of the anterior and posterior tibials may demand ligation of those vessels somewhere in their course. However, genuflexion is to be thoroughly tried before the ligature is thought of; and pressure, digital or instrumental, is to be methodically and persistently employed before the more dangerous operation of ligation is tried. Elevation of the foot and leg may accomplish considerable in arresting the flow of blood.

The anterior tibial artery rests upon the interosseous membrane, and is found by hunting for it in the first intermuscular space, reckoning from the prominent edge of the tibia outwards. In the upper part of its course the anterior tibial artery lies between the tibialis anticus and extensor longus digitorum muscles; in the middle of its course the artery is still next to the tibialis anticus, therefore in the first intermuscular space, but the extensor proprius pollicis comes against it on the outside; in the lower third of its course the artery is quite superficial, being covered by the integument, annular ligament, and fascia, and is between the innermost tendon of the extensor longus digitorum group, and the extensor proprius pollicis. Below the ankle-joint the artery takes the name of the dorsalis pedis, and soon sinks into the first space between the metatarsal bones, though some small digital branches extend to the toes.

FIG. 60.



Ligation of the anterior tibial artery in the upper part of its course.

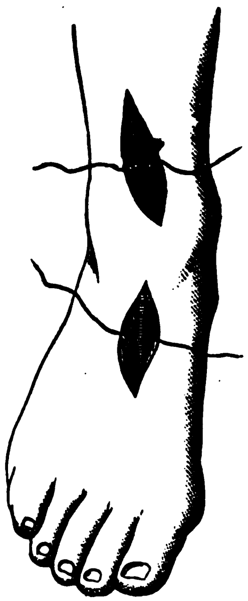
In dissecting to find the anterior tibial artery the integument should be incised to the extent of three or four inches, one end of the cut beginning at the edge of the tibia; the fascias, superficial and deep, are to be divided freely, and the foot flexed so as to expose the first intermuscular space. The anterior tibial nerve lies in the same intermuscular space, but a little external to it. The aneurismal needle is passed around the artery, cleaned if possible, yet not much harm comes from including one or more of the venæ comites.

The same rules apply for ligating the artery lower down, or just below the middle of the leg; but near the ankle the tendon of the extensor proprius pollicis gets to the anterior side of the vessel by crossing it, therefore the ligation must take place outside this tendon, which is the best guide to the artery.

Ligation of the Posterior Tibial Artery.—The posterior tibial artery lies so deep in the upper third of the leg that its ligation is an exceedingly difficult operation. Mr. Guthrie proposed to make an incision five or six inches in length, along the middle of the calf, over the position of the vessel, and through the gastrocınd soleus muscles; and Mr. Arnott, in a case of wound- an opportunity to carry the proposition into effect.

ɜ lower part of the leg the posterior tibial artery is not to reach. Near the ankle the artery lies between the chillis and the internal malleolus, the vessel being a arer the bone than the tendon. At a distance of two or ıches above the malleolus, the artery is found in about e relations to the posterior border of the tibia and the chillis. An incision three inches h is made in the integument and al fascia over the course of the then the deep fascia is raised, and split on a director in order to he artery, and the nerve and veins accompany it. The artery lies the inner margin of the flexor ligitorum. In passing the aneu- ıeedle, care must be exercised that rument does not include the poste- ial nerve, or the venæ comites.

FIG. 61.



Ligation of the anterior tibial, and dorsalis pedis arteries.

io-*Venous* aneurism consists of a ıcribed vascular tumor which com- tes with an artery on one side and on the other. Varieties of the have been called varicose aneurism eurismal varix. The commonest f the disease is the unskilful per- ce of venesection at the elbow; penetrating wound which inflicts ımeous injury to an artery and vein ie in juxtaposition, may be fol- by an arterio-venous aneurism. Gun-shot injuries are 'requently followed by a communication between an artery in, and an aneurismal condition of both vessels at the f injury. A gentleman of my acquaintance has a com- tion between the temporal artery and vein which was pro- ɔy a bird-shot. No great inconvenience is caused by the mal condition beyond that of a disagreeable vibratory rhich is constantly heard. The vessels in the vicinity of ıor are enlarged, and appear disturbed by a conflict of s. The veins exhibit a pulsatile state, and a marked ity. In fact the arteries assume the character of veins,

and the veins take an arterial condition for some distance
the tumor.

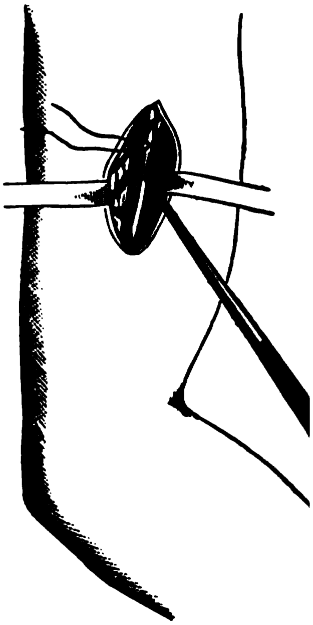
An arterio-venous aneurism can be emptied by compr
the artery with the finger, and the ear detects the blowing
or rasping bruit peculiar to the disease.

The treatment of an aneurismal varix is substantiall
same as for true aneurism, yet the prospects of success are n
good. Pressure on the artery above and below the tumor
not produce coagulation in many instances; and ligation ha
proved a flattering procedure. The elastic bandage wor
hour or two each day may effect coagulation, though this m
has failed.

Cirsoid Aneurism is a dilated, elongated, and tortuous condition of an artery, with a thinning of its walls, the aneurismal vessels appearing like pulsating veins. The disease oftenest attacks the arteries of the scalp, and enlarges the smaller arterial branches, so that the capillaries at length become dilated pouches. From the fact that the vascular enlargement reaches a network of arteries and veins, the disease has been called *aneurism by anastomosis*.

In a case at present under my observation, the aneurismal state which was first noticed in the occipital and posterior auricular arteries two years ago, has now reached the temporal and its branches, and the external carotid.

FIG. 62.



Ligation of the brachial artery for t
of arterio-venous aneurism at the
the elbow. The aneurismal needle
surrounding the artery above
branch.

The want of success and fatal consequences which have attended operative interference
cirsoid aneurisms have deterred me from attempting treatm
the case under my care. A surgeon who was consulted co
ing the case some time ago, offered to ligate the external ca
but I persuaded the patient not to incur the risk.

I once cured a cirsoid aneurism of the scalp by repeated injections of a solution of gum from the eucalyptus rubrum. Dr. Broyer, of Australia, sent me the gum, and I found it very astringent as he had stated. After making a strong solution, and filtering it, I used a large hypodermic syringe to throw the medicine beneath the scalp. Some inflammatory action was excited in the course of a day or two, but suppuration was not induced. In a week it was evident that the vessels had shrunken, and less pulsation was observed. In the course of two weeks I repeated the operation in another place with similar results; and after ten repetitions, which extended through a period of four months, the aneurismal condition was substantially overcome.

DISEASES OF THE VEINS.

Phlebitis.—It was once supposed that a vein would readily inflame, but experiments conducted upon the veins of the lower animals have led modern pathologists to doubt whether phlebitis is at all common. *Lymphangitis* is a difficulty of far more frequent occurrence than inflammation of the veins. In what is called "milk-leg" in a puerperal woman, the lymphatics of the limb are affected more than the veins; and so it is in cellulitis, erysipelas, and other diseases that once were arranged under the head of phlebitis.

When a vein is punctured, bruised, or lacerated, rough points in its lining membrane are produced, which serve as centres of coagulation, as if a thread or fibrous substance were introduced within the vessel, as a starting-point for a clot; and the coagula, minute at first, grow into a thrombus and wholly obstruct circulation in the injured vein. Phlebitis, then, consists more in venous obstruction through coagulation and fibrinous deposits, than in actual inflammation.

Where a large venous thrombus exists, or several small ones, a softening of the clot may take place, and even suppuration may be reached, when the disease is denominated suppurative phlebitis; more or less pus which has passed the lungs, as it may, after flowing into the heart from the veins, gets ensnared or stranded in the capillaries of the liver, spleen, kidneys, and even in the muscles—and these purulent deposits are called *metastatic abscesses*. A collection of pus in parts not inflamed comes from a venous thrombus which is undergoing putrid or suppurative liquefaction.

Pressure upon veins whether from position of the body, or the presence of tumors, will cause coagulation, thrombosis, and suppurative phlebitis; and metastatic abscesses may be the consequence. Compression of the axillary veins produced by cancerous deposits in the axilla, often results in coagulation, thrombosis, and obliteration of the veins of the arm, so that the limb becomes œdematous, stiff, and painful. The pressure of an aneurismal tumor has been known to cause coagulation in adjacent veins. The pressure of one of the fragments of a fractured bone—say the femur—may cause coagulation in the femoral vein, and thus lead to non-union through œdema and impediments to circulation in the limb.

The hard cord-like feeling a diseased vein presents does not usually come from thickening of the walls of the vessel, nor from inflammatory deposits upon its inner or outer coats, but from the coagulated blood within. When plugged veins exist in a limb, the œdema which follows does not pit under pressure like a serous infiltration, but the parts distended are hard, and quite unyielding to the pressure of the finger.

When the deep veins are obstructed by clots and inflammatory deposits of lymph, the morbid condition is obscure. The superficial veins would necessarily be surcharged, and more or less œdema exist, yet such conditions might arise from other causes, therefore the diagnosis could not be clearly made out. Inflammation of the lymphatics presents similar features, except it be more acute, more superficial, and restricted to the course of the lymphatic chain, than in phlebitis of the deeper veins.

The treatment consists in rest, elevation of affected parts, a generous diet, and the administration of iodoform, phosphorus, arsenic, sulphur, veratrum, digitalis, iron, and quinia. Of course, all these agents are not to be administered at once, or in the medication of a single case; but two of them may be given in alternation for a week, and then two others may be tried for the same length of time, and so on till several have been administered.

The use of a flannel bandage, not applied very snugly, will support the dilated superficial veins, promote absorption, and thus improve the general condition of the limb. The elastic stocking has been known to effect a cure, even when the deep veins of the leg were known to be obstructed. Liniments and douches do very little good. To illustrate the nature and management of crural phlebitis, I will report a case that recently came under my care. Mr. Temberman, sixty years of age, in feeble health, was attacked with great pain in the right leg after exposure and unaccustomed exercise. Hot applications were used, morphia employed hypodermically, and liniments tested, but all without producing relief. An inflammatory spot near the ankle, and in connection with an old cicatrix which followed a wound made with an ax, seemed to be the center of the acute morbid action, yet the superficial veins of the limb grew hard and knotted. Certain spots were worse than the general state of the leg; these seemed to be in an erysipelatous condition, yet real erysipelas did not exist.

At length, after many kinds of treatment had been tried, and all unsuccessfully, the flannel bandage, applied afresh every day, performed a complete cure. No other agency could be made to do the least good.

Suppurative Phlebitis.—Diffused phlegmonous inflammation, with a tendency to suppuration, has been regarded as suppurative phlebitis, though it is not certain that the veins are especially at fault. In the progress of the disease, whatever be its cause, the capillaries get obstructed, effusions of serum and lymph take place, the nerves suffer from pressure, and at length a suppurative stage of inflammation is reached.

A person enjoying a fair state of health is never attacked with suppurative phlebitis, but the enfeebled, the poverty-stricken, and the debauched, are those likely to be sufferers from capillary congestion in the feet and legs, crural ulcers, herpetic eruptions, erysipelatous invasions, cellulitis, and other morbid conditions of the lower extremities which may lead to phlebitis of a suppurative nature. Infiltrations take place along the course of the veins, inflammation is provoked, abscesses form, and a typhoid state is ushered in with a chill. The disease has now reached a dangerous stage, consequently the patient must be carefully nourished and medicated, or death will intervene.

The treatment is not to differ essentially from that laid down for ordinary phlebitis, except that the abscesses are to be discharged as fast as they appear or show signs of having reached the suppurative stage.

Phlebolithes.—Varices of the leg, and tortuous veins about the bladder and prostate have been known to be the seat of calculous formations, which from their origin or location, have been called phlebolithes. The difficulty is not a common one, and its existence has been denied by several experienced pathologists. In 1872, I was critically examining a hypertrophied bladder and prostate which were taken from the body of a man who died of a genito-urinary disease; and in my manipulations I discovered hard lumps in some dilated veins near the vesiculæ seminales. Upon opening the varices I found concretions which scratched the edge of the knife like calculi, and the gritty matter enclosed in a capsule of hardened lymph could be easily felt when rubbed between the thumb and fingers. These calculous masses were phlebolithes beyond question. The subject in which they were found was about seventy years of age, and had been a sufferer for many years from "gravel," though no stone nor gritty particles were found in the bladder.

There is no rational treatment for phlebolithes, even when they are known to exist. It would not be good surgery to cut open a varix of the leg to remove a concretion—better let the patient continue as he is, or attend to his general condition, and let the phlebolithes take care of themselves.

Hypertrophy, or dilatation of the large veins, is not exceedingly uncommon. The vena cava and the portal vein have been found enlarged after death; and such a condition has been suspected during life.

Disease of the venous side of the heart is quickly noticed by an enlargement of the external and anterior jugular veins. And an anasarcous condition of the body is frequently a sequence of a dilated state of the entire venous system.

Atrophy of veins follows the removal or disease of a part; castration is followed by a perceptible shrinking of the spermatic veins; and amputation of the leg is succeeded by an atrophied state of the veins just above the end of the stump. The umbilical veins shrivel to fibrous cords a few days after the birth of the child. But none of the conditions cited indicate atrophy which is morbid, therefore it is not to be looked upon as a disease. Obstruction and consequent obliteration of veins may occur much oftener than atrophy purely as such.

Varices of the legs which differ somewhat from venous hypertrophy are very common, so are enlargements of the hemorrhoidal veins, but these constitute morbid states to be discussed under other heads, (see *hemorrhoids*, and *varicose ulcers*). The veins of the lower extremities have to sustain a column of blood which exerts much dilating force through gravitation, though a system of valves serves to distribute the pressure along the course of the vessels. But if the veins get much dilated, the valves fail to reach across the vessel or to close it, and a tortuous condition becomes a partial substitute for valvular action. During violent exertions as in wrestling and carrying heavy weights the blood in the deeper structures is forced into the subcutaneous veins to an extent which produces varices and venous pouches. In some instances the distending force is so great that rupture of the vein-wall is produced and hemorrhage ensues. Obstruction of the venous circulation in the legs is often followed by œdema and inflammatory exudation, so that the limbs grow clumsy, stiff, and dusky. More swelling appears at night after a hard day's work, or fatigue from standing long on the feet; and less tumefaction will be observed in the morning after a good night's rest.

Treatment.—The management of varicose veins, eczema, and ulceration, is chiefly by rest, and mechanical pressure brought to bear through the influence of a flannel bandage or an elastic stocking. In fact, the same treatment advised for varicose ulcers is applicable in the management of varices, and venous obstructions. Where ulceration exists and an ichorous eczema, the bandage should be used until there is no fluid exuded, and then the elastic stocking is to take its place.

Feeble and ill-nourished patients must have their general health improved by the employment of a generous diet, and the administration of iron and bitter tonics. The worst cases to manage are those that come from excessive drink, for inebriates will not follow professional directions, but keep their blood thin and their tissues lax by excessive potations, and insufficient nourishment.

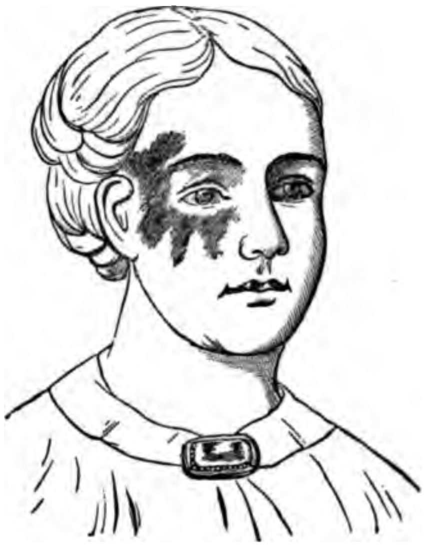
Operative measures, such as ligating on each side of a varix, and obliterating venous pouches by the action of powerful escharotics, have been advocated from time to time by surgeons of eminence, yet all heroic plans are attended with danger and frequent failure.

NÆVUS MATERNUS.

Children are occasionally born with unsightly marks on the face and other parts of the body. These blemishes arise from excessive vascularity in the integument, or from enlargement of the capillaries of the parts disfigured. The area affected sometimes increases with age in a ratio greater than that of the general growth of the body. In some instances the hue, which is striking at first, diminishes as time passes.

When the discolored patch is brown, it is called a mole; and when it is red, it is denominated a port wine or brandy spot. The prevailing notion is that maternal impressions and longings while the child is *in utero*, are the cause of the marking.

Fig. 63.



Nævus in the vicinity of the eye.

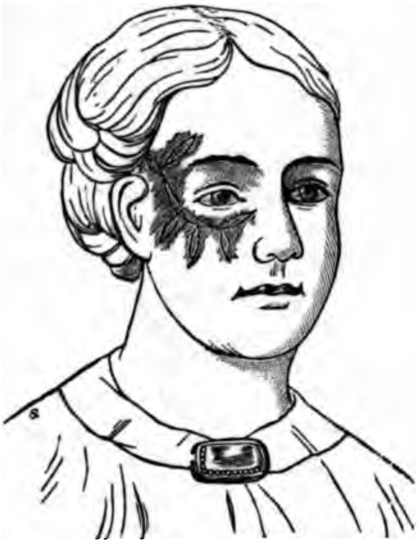
A *nævus maternus*, or "birth-mark," from the excessive vascularity already alluded to, often becomes thickened, and raised above the surrounding tissue. Occasionally a distinct pulsation can be felt in the tumefied mass, which indicates that vessels of considerable size contribute to the formation and growth of the morbid structure. Elevated points, having an angry aspect, may stud the mottled field.

When the hue of a nævus is excessively red, a predominance of the dilated vessels may be deemed arterial; and when a blue or dusky color prevails, the patch is supposed to have an undue proportion of veins or venous spaces.

The scalp, face, and neck, are favorite seats for nævi, though the genitals have such marks oftener than is generally supposed. No part of the body is absolutely exempt from "mother-mark."

If a nævus be seated on the border of the lip, prepuce, or vulva, where the cutaneous and mucous tissues blend, a tumefaction is apt to exist which may prove an uncomfortable deformity.

FIG. 64.

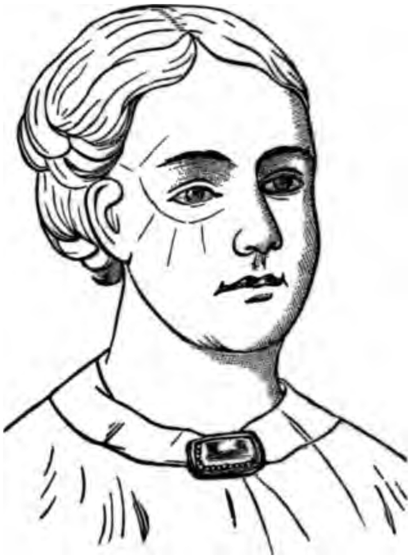


Elliptical incisions made to remove portions of nævus.

An unsightly nævus is generally improvable or entirely removable by a surgical operation. Caustics may effect a partial obliteration, but the cicatrose condition sure to follow the destruction of tissue by the use of escharotics, is likely to be more disfiguring than the original blemish.

The operation least objectionable in the removal of nævi is of a plastic character—the discolored integument being dissected out, and the gap filled by drawing the edges of the wound together. To execute this plan without causing a pucker in the surrounding structures, or distorting the mouth, nose, eyelids, and other important features of the face, requires considerable care and tact. If the mottled patches can be removed b cising a series of ellipses, which will leave wounds that ca closed, and simply linear cicatrices, there is hope of a ra obliteration. The closure of the elliptical chasms is to be eff with silver sutures and adhesive strips. The sutures shoul of fine wire, and introduced with delicate needles; the adh strips are applied across the wound, and in such a way as to re the sutures from tension. The depth of the incisions need be much greater than the thickness of the skin. Several el cal pieces may be taken out at one sitting, if the size and s

FIG. 65.



Linear cicatrices left after nævus has been removed by repeated operations.

of the nævus be such as to require the excision of a numb ellipses. The extent of the pieces is to be governed b amount of integument which can be spared without disto the features by tension. If a nævus on the cheek be two i in its longest diameter, and an inch across, it may be w take away an elliptical piece of integument as long and nea wide as the discolored splash, especially if the edges o wound can be approximated without undue tension upo mouth and eyelids. Several silver sutures should be emp to close the gap, and then the sutures should be well supp with strips of adhesive plaster. The dressing should n removed for about a week, and then there will be no danger of a wide cicatrix. At the expiration of two weeks from the first operation, a second may be performed. This may be very unlike the first; instead of the removal of one large piece, several small ones may be excised, and each designed to remove some portion of the remaining nævus. Possibly it will be best to take out a large elliptical piece in a direction across the old cicatrix. This wound is to be managed like the first; and in two weeks a third operation may be in order—this time, by a series of small ellipses, to extinguish the remnants of the disfiguration. It will be found at each succeeding operation that the skin has so far stretched that as much more integument can be removed without creating deformity by tension.

Miss T., with a discolored patch on the face, near the eye, as represented in the first diagram, came to me for relief. I excised seven ellipses at the first operation; and closed the wounds with fine silver sutures. The needles were delicately proportioned to the size of the wire. Adhesive strips completed the dressing.

In three weeks I performed a second operation, removing five ellipses, and treating the wounds as indicated above.

In four weeks from the second operation I performed a third, this time removing six ellipses. This last procedure took away every vestige of the original deformity, and left a few linear cicatrices which were scarcely observable.

It is well to have in view the direction of muscular fibres underneath, while making these plastic operations upon the face; also the natural course of wrinkles, that the cicatrices may be hidden as much as possible.

A patient with good nerve will require no chloroform while undergoing the operation. However, there is no special objection to the employment of anæsthetics.

I operated satisfactorily upon a young man with a nævus near the external canthus of the left eye, the disfiguration reaching to a part of the under lid, to a spot above the eyebrow, and upon the temporal region. I took out two large ellipses at the first operation; three at the second; and two at the third. The obliteration is perfect, and the cicatrices are not observable.

A small nævus in the scalp of a child, which pulsates and is inclined to spread, may be subdued by the daily application of carbolic acid. The per-chloride of iron, and other mineral astringents, will arrest the inclination of the disease to spread.

Pulsatile tumors may be removed with the galvano-puncture, and with ligatures thrown around needles which have been made to transfix the morbid mass. However, none of these methods are equal to excision. The timid may be afraid of exhaustive hemorrhage, but I will assure them that a few minutes pressure of the finger in the wound, after the tumor has been excised, will arrest anything like a dangerous flow of blood. A few jets of blood from arteries the size of a needle, will do no harm; and no ligation will be necessary. Close the elliptical wound with sutures and adhesive strips, and no hemorrhage can take place. If the wound needs moderate pressure, a compress and bandage may be used. Infants may be operated upon, but it is generally best to let them alone until they have acquired some firmness and constitutional stamina.

It may be proper to remark that in making the elliptical incisions the knife should be held so that the borders of the wound shall have perpendicular edges, to avoid a broad cicatrix. An obtuse angle to the wound is sure to be followed by a bulging point; an acute angle leaves the integument even, and the cicatrix is a mere line.

Angiomata, or vascular tumors, are met on all parts of the body, yet they may not be objectionable unless located upon the hands or face. Vascular excrescences upon the lips may attain monstrous sizes, and produce hideous distortions; and the same kind of developments upon the genitals may interfere with the functions of those organs.

SECTION VII.

PLASTIC SURGERY.

RHINOPLASTY.

A CERTAIN class of deformities can be overcome only by transplanting flaps of integument. In some cases the operation amounts to little more than freshening the edges of a fissure, and joining the raw surfaces. Such is mostly the procedure in harelip and cleft-palate operations. But when a nose is to be constructed, or a lip to be formed, flaps of integument have to be borrowed from the immediate neighborhood, and slid or twisted, so that they may be attached to the borders of the chasm or place where they are to rest, yet retaining their original hold by a narrow pedicle through which vitality is maintained until new attachments are formed.

A large piece of skin can not be entirely dissected from the arm, and then made to unite with the nose or lip, though a minute portion of the integument can be successfully transplanted, as in grafting. But the arm may be bound to the head for several days, while a flap of skin is attached to the freshened borders of an old wound of the face. And when the union of the flap is firm, a separation of the arm-connection can be made without danger of death to the transplanted part. In the lower animals a complete separation of a part may be made, and then a successful transplantation be secured. The spur of a cock has been transferred to his comb, and pieces of a rat's tail made to grow in the top of the head, so as to resemble horns. And we read of fingers and noses re-adhering after having been completely cut off. In several instances I have known fingers that were almost severed to re-unite, but the piece of skin left uncut undoubtedly had much to do with the continuance of vitality and the tive action.

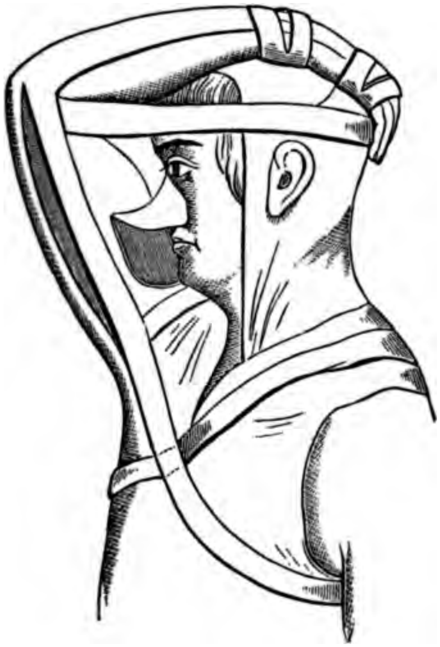
A flap of integument which retains its original connecti pedicle, becomes blanched from loss of vascular suppli somewhat shrunken. The temperature falls, and the dea appearance of the part leads the operator to think the pe too small, or is strangulated by the torsion imparted However, if every thing be favorable, it will not be long the natural heat and color return to the flap, and new sou vital supplies are obtained from the vivified border.

In the execution of a delicate plastic operation, several i ant points are to be kept in view. Among these may b tioned that the flap must generally be larger than the plac re-supplied with integument, to cover shrinkage; the should be a bearer of vascular supplies, and not strangula torsion; and the surfaces to be united must not be held a clots of blood. Sloughing of a devitalized flap usually about the third or fourth day; if the flap retain its beyond that time, little is to be feared. While the dan period is passing, it is not well to examine the wound oft light covering of lint or cotton-wool helps to retain a temperature; and this dressing may be changed every day patient is not to meddle with the flap, nor with the dre It is generally best to join the edges of the flap to the fre borders of the chasm to be filled, with silver sutures—the being pure, and the wire very fine. Coarse wire must used. The stitches should be close together, and may ren place for eight or ten days.

Rhinoplastic Operation.—Gasparo Tagliacozzi, a surg Bologna, made a new nose from a flap taken from the arm manner of operating was as follows: The piece of skin transplanted was raised from the left arm over the biceps by lifing a patch of sufficient size with forceps, then double-edged knife the operator transfixed the piece, and en the two wounds to the extent of two inches, yet leaving th of integument attached at its two ends. A pledget of lint in oil or cerate was drawn beneath the flap and its ends hu of the two incisions. This was kept in place for several allow the under surface of the belt of skin to cicatrize, a flap to become vascular, as a preparatory measure. The fl then cut loose at its upper extremity, yet left attached lower end until the piece had become thickened, contracted, and wrinkled. At about the fourteenth day after the severance of the upper extremity, the flap was considered to be in good condition, or in a state of maturity.

The patient was then purged, cleanly shaved, and dressed in a leather jacket, which was to serve as a support to the arm when raised to the face. The jacket had a breast-plate and a cap or head-piece. The edges of the flap were made fresh, the borders of the nasal aperture were pared, and then the left hand of the patient was bound to the back of the head. This brought the flap and nose in contact, when sutures were applied to hold the free end of the flap in the position it was to occupy when union had occurred. On the fourth or fifth day the sutures were removed, but the hand and arm were kept bound to the head until the twentieth day. At the expiration of that time, the flap was cut at its lower extremity, and the arm set at liberty. A little modeling was required to convert the lower end of the flap into shapely alæ nasi. If the septum was deficient, a piece of integument was raised from the upper lip to supply the defect.

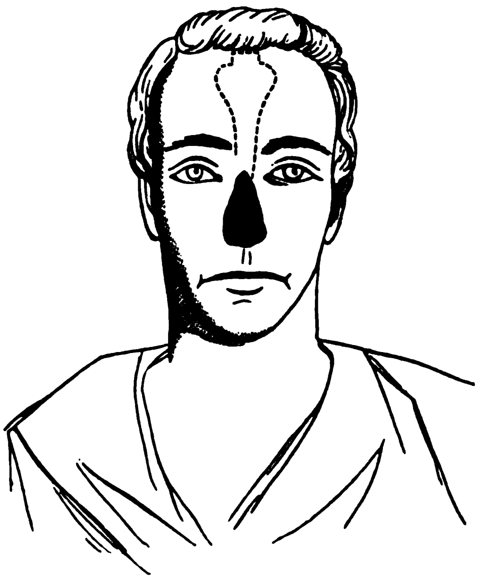
FIG. 66.



Rhinoplastic operation of Tagliacozzi.

Although the method of Tagliacozzi was ingenious and often successful, modern surgeons prefer what is called the Indian operation, which consists in taking the flap from the forehead. It is performed as follows: The operator cuts a pattern from leather, which in shape is like the side of a common bellows, and after laying it upon the forehead, he marks around it with ink dots. If the hair grow low on the forehead, the quadrangular piece which is to form the nasal septum will reach above the hair-line. The lower end of the flap constitutes the pedicle, which terminates at the root of the nose. In marking out the flap on the forehead, a quarter of an inch on all sides must be allowed for shrinkage. The edges of the nasal chasm are to be carefully pared, and if a bit of skin remains on the nasal bones, it must be excised to make room for the flap. A scalpel is next used to cut clear round the flap on the inked line, except at the lower extremity, which is to constitute the pedicle. The blade of the knife should be so held that the extreme border of the flap shall be full. If the under surface of the flap be the broader, by reason of holding the knife inclined the wrong way, the joining will not be easy, and the cicatrix will be more apparent. After the flap is marked out with the knife-cut, it is to be dis-

FIG. 67.



Rhinoplasty as performed in India.

sected from above downward, and as deep as the occipito-frontalis tendon. The dissection must be conducted with great care, lest the flap be incised, or the knife reach the cranium.

After the flap is made free down to the pedicle, it is not immediately turned down and united in its new place by sutures, but plenty of time is allowed for all hemorrhage to cease. When all is ready the flap is carefully turned down to the position it is to occupy—the pedicle being twisted with care that strangulation of the vessels does not occur. The columna or septum, is first to be fastened in place by two sutures introduced with a much curved needle. The sides of the flap are then stitched in place with sutures a quarter of an inch apart—silver wire being used instead of thread. The nostrils are to be molded into shape and supported by two small vial corks, or the ends of two gum catheters of large size. The fenestra will let air and fluids through. If the catheters be not large enough, they may be wrapped to the desired size. In dressing the new nose no pressure is to come upon its ridge, but a little may bear along its sides. The wound in the forehead may be drawn together with waterproof plaster, and a wet compress is to be kept upon the spot until it has healed. The cicatrix is not strikingly observable. The sutures may be removed on the tenth or twelfth day, or as soon as union has taken place between the edges of the flap and the base of the old nose. The lump created by the twisted pedicle is not to be divided and shaved off until the new nose gets vascular supplies from its border, which will probably be a month from the time the transplanting occurs.

At the end of three or four days from the date of the primary operation, the flap will be found tumid, warm and sensitive, though pale; but in a week the ordinary color or tint of the forehead appears in the new nose.

If only the end of the nose be lost by disease or violence, it is not necessary or even practicable to bring down a flap from the forehead; but with a little study and care two flaps can be dissected from the cheeks on each side of the nose, the pedicles terminating at each ala, and then twisted enough to form the two alæ, their free ends uniting in the middle, or point of the nose. The free ends of the flaps may be started near the inner canthus of the eye, or at the prominence of the cheek; and they can be twisted from those locations with the greatest ease; and the wounds can be closed so that only a linear cicatrix remains. The free ends of the flaps may be made wider than the rest of the strips, to form a natural tuberosity for the end of the nose, and a columna is to be taken from the upper lip.

It is difficult to remedy a nose pugged at the end and sunken in the middle, through the ulcerative action of syphilis. In fact, no operation will restore a crest or ridge to the nose when the central support is all gone. The most experienced operators will not attempt to make a new nose, if it is going to sink or flat in an unsightly manner, through lack of a vomer, or some kind of support along the central line.

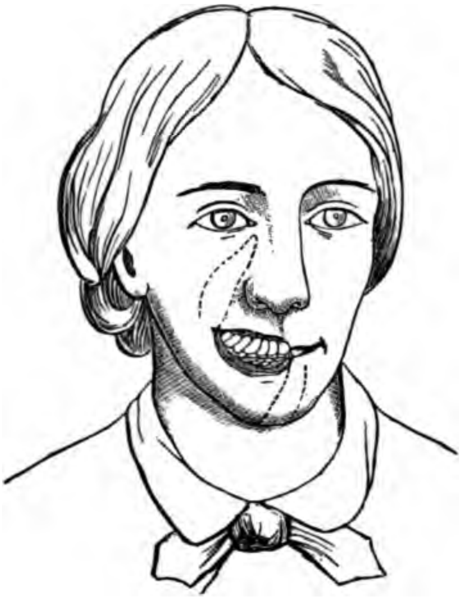
I have greatly improved a "syphilitic nose" by dissecting a triangular flap from each cheek, and twisting them upon narrow pedicles, so that their bases should meet in the middle line. But before the flaps are raised, a freshened surface is to be prepared for them, and the turned up tip of the nose and alæ so freed with the knife from parts above, that they will easily return to their original position. The two flaps fill the chasm dissected for them. If care be taken to offer central support by means of plugs of lint crowded into the nostrils, the central region will not sink much. If the restored nose be not handsome and shapely, every body will not know the nature of the disease that caused the deformity.

CHEILOPLASTY.

Cheiloplasty signifies an operative procedure for restoration of a lost lip. An ulcerative action, produced sometimes by the abuse of mercury, will destroy a part of the lip, uncovering the teeth, and allowing the saliva to dribble incontinently. To illustrate the difficulty and the method of curing it, I will cite a case. Miss Stebbins, of Indiana, a young woman twenty years of age, came to me with an unsightly deformity of one side of the face, which was produced, she said, by the use of calomel when she was a child. The ulceration had exposed the teeth from the last molars to the lateral incisors on the opposite side—the median line of the lips being passed by the destructive process. She kept a handkerchief against the chasm all the time, in order to hide the deformity, and to prevent the saliva from running down her chin and neck. The incisor and canine teeth of the upper jaw were very long, and stood out in a hideous manner as teeth are wont to grow when deprived of the pressure of the lips in childhood. I extracted the teeth at the commencement of the operation, as they could not be covered with a new lip; and if they were closed in, they would make the lip protrude to a disgusting extent.

I pared the borders of the fissure, and marked out with ink-dots the flap for the upper lip—its upper end reaching to a point on the side of the nose above the inner canthus of the eye. In shaping the pattern I allowed something for shrinkage, and estimated other changes that might occur in the flap. While the patient was under chloroform I cut around the flap, except its pedicle at the angle of the fissure, and dissected it free, embracing integument, sub-cutaneous tissue, and a thin layer of muscle. The bleeding was inconsiderable; and I swung the piece into the postion it was to occupy, and joined its upper border to the freshened edge of the aperture with several silver sutures. I then closed the wound in the cheek by drawing its edges in contact with sutures and plasters.

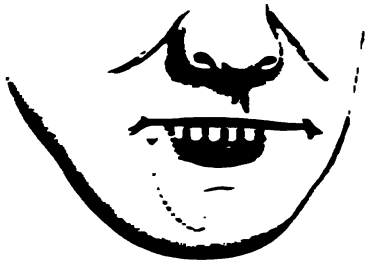
FIG. 68.



Parts of the upper and lower lips to be restored by transplanting flaps from the vicinty of the chasm. The dotted lines on the face and chin show the outlines of the flaps.

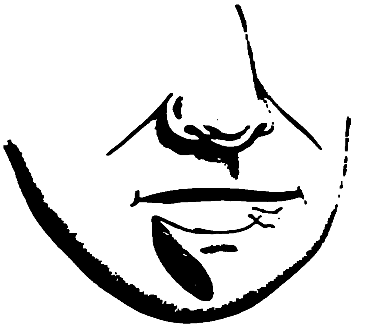
The next step was to make out a flap for the under lip. The pattern extended considerably below the chin. The base or pedicle of this flap was attached to the under lip where the chasm terminated, which was a little outside the median line; and free extremity extended to the base or pedicle of the flap t constituted the restored up lip. After the flap was twi into the new position it wa occupy, sutures were employe hold the new lower lip in pl But its free edge would make a handsome border; dissected a flap of mucous m brane from the sulcus betw the roots of the teeth and remnant of the old lip, and tr formed it into a covering "finish" for the border of new lip. The wound mad the chin by the removal of flap was drawn together with tures, and the deformity was duced to two linear cicatr The healing processes in all traumatic surfaces were exc ingly satisfactory, no untow feature presenting itself. transformation was almost m cal, yet when about to go h she remarked that she wish had not left those two scars!

FIG. 69.



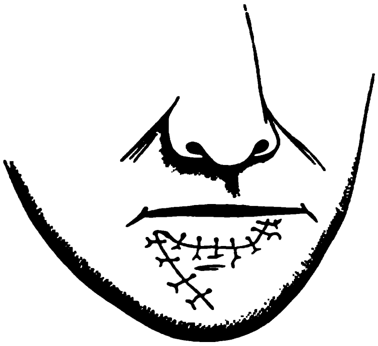
The outlined flap that is to fill the chasm in the lower lip.

FIG. 70.



The chasm in the lip filled with the transplanted flap.

FIG. 71.



The gap from which the flap was taken filled by drawing together the borders with sutures.

The lower lip is often cut a by ulcerative action—epith ma being the commonest ca The labial defect exposes teeth clear to their roots, permits the saliva to run d the chin as fast as it is secr To overcome the deformit flap must be transplanted shall fill the chasm. Sev methods have been propose a restoration of the lip, al which will do very well. I fer the plan of my own, which is illustrated by the accompanying diagrams. Mr. Caldwell, from near Portsmouth, Ohio, came to me with a chasm in the lower lip which was produced by a cancroid ulceration, and caused to heal at its borders by the application of an arsenical plaster, prescribed by a German apothecary. I cut from paper a pattern of the chasm, and turning it down I marked its outline with ink on the side of the chin. I freshened the border of the chasm, and cut along the dotted line to make a flap. I left a pedicle in the edge of the lip adjacent to the chasm. I next dissected up the flap, and having turned it into the space to be filled, I fastened it there with sutures, inserting two stitches at the extremity opposite the pedicle. I then dissected underneath the borders of the open wound from which the flap had been taken, and closed the gap with sutures, without puckering the integument. Some additional sutures held the lower border of the flap to the integument below.

The flap united readily, and the lip was restored. The free edge was not as nice as it would be with an epithelial covering, but in appearance it was not objectionable. The cicatrices were not so observable as when two flaps are employed in filling the chasm, and the operation is reduced to its greatest simplicity. If the ulceration extended very low, the flap would have to be taken in part from the integument beneath the chin.

In the event of unsightly deformity from burns, it is often practicable to dissect away the cicatricial tissue, and fill the gap with flaps taken from adjoining integument. As all cases differ in form and magnitude, no special rules can be given for restoring lost parts, but each case becomes, to a certain extent, a special study.

PLASTIC OPERATIONS ON THE EAR.

Occasionally a child will be born with a defective external ear, which may be remedied by a plastic operation. In one instance a child came into my hands for treatment whose right ear was devoid of cartilage, and fell downward and forward like that of a hound or spaniel. To overcome the principal part of the defect, I dissected a narrow strip from the scalp behind the ear, and another from the posterior aspect of the ear, and then joined the borders of the wounds with sutures. The healing process united the back of the ear to the side of the head, and left very little deformity which was observable.

When the lobe is split by the ring of an ear-drop, the side
the wound can be joined at once with sutures or adhesive str
but this dressing may be neglected, and a permanent slit
follow. To close this its edges must be freshened, and then
borders united with sutures. I have obliterated such fissure
several instances, and never had one fail.

Other parts of the body, especially the genital organs, not
frequently present congenital defects, or deformities follo
burns and ulcerative diseases, which are only remediable by
tic operations. But as each case is a study of itself, no sp
rules can be laid down for its cure. Sometimes a cicatricial
has to be dissected away, and the gap filled with a flap of adja
tissue. A fistulous opening is to be closed by freshening
edges of the gap, rent, or fissure, and then closing it with sut
placed near together. In cases of hypospadias that do not ex
far behind the frenum, or where the frenum should be, no op
tion is usually demanded. In one case, where the raphe of
scrotum came too far forward, in connection with a partial h
spadias, I excised a piece of the middle and anterior portio
the scrotum, which set the penis free, and restored to it a no
length. Plastic operations are sometimes needed to constru
artificial anus.

The cicatrices of burns in the neck and near the joints,
quently cause such deformities, and so impair the functions o
parts, that plastic operations have to be performed in ord
remedy the defects as far as possible. Hare-lip and kindred
rations will be described in other places.

SECTION VIII.

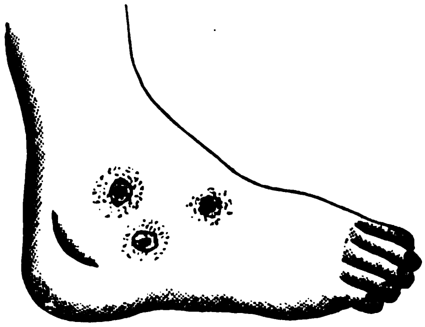
BONE DISEASES.

Ostitis signifies inflammation of bone; yet so intimately associated with the osseous structure is its investing membrane that there can not well be inflammatory action in the bony tissue without periostitis, or inflammation of the bone-enveloping sac. The long bones have a membrane which lines the medullary cavities, called endosteum, consequently such a diseased state as endostitis or osteomyelitis is possible. But how the single morbid state could be diagnosed, or be known to exist, is not clear. Probably in nearly all cases of ostitis, the investing and lining membranes are involved in the inflammatory process.

The cancellated structure of the short bones, and of the extremities of the long bones, may undergo inflammatory action, and result in abscess, without specially implicating the periosteum, yet that membrane must sooner or later suffer, unless the ostitis quickly and happily subside. The reticulated osseous tissue of the tarsal bones is apt to admit of tuberculous deposits; and at length these soften and establish abscesses which have sinuses and fistulous openings. Although the dead bone in and about these abscesses may be spoken of as necrosed osseous material, the necrotic state is that by disintegration, or by particles, and is therefore *caries*. In some instances an entire tarsal bone becomes necrotic, and may be removed in its entirety, which would indicate that necrosis is the proper term to use in describing the disease. In Pott's disease of the spine, the body of a vertebra becomes softened or carious; and more or less ostitis, and, perhaps, periostitis accompany or constitute the morbid process. In suppurative arthritis, whether of the hip, knee, or other joints, there is necessarily ostitis, and as certainly periostitis.

In syphilitic diseases of the bones, the periosteum is usually attacked first, and the osseous tissue somewhat later. The ostitis may result in softening and ulceration, but it as commonly establishes an ivory hardness of the osseous structure which encroaches upon the cancellated spaces and medullary cavities. A syphilitic tibia may take on nodular deposits, and undergo eburnation at the same time, so that through increase of size and density, there might be very marked additional weight in the bone.

FIG. 72.



Caries of the tarsal bones.

Ostitis may be alleviated by the local application of anodynes rest, good living, and favorable surroundings; if, however, the inflamed bone suppurates, the morbid process is apt to be tedious a carious state continuing for months and even years. Bandaging the part inflamed with flannel rollers, may aid in the reparative process, yet too much should not be expected of any kind of treatment. If the patient be feeble and scrofulous, peptics tonics, and the most inviting of nutrients must be employed It is idle to think about any one remedy which is to prove a specific in the cure of the disease. The patient is to have every healthful advantage; and to be encouraged to endure a prolonged siege of sickness, but with the expectation of a favorable result in the end.

When the discharge of disintegrated osseous matter can be facilitated by free incisions, they should be made; and when carious bone can be dislodged by the use of a drill, osteotrite, gouge-forceps, and raspitorium, those instruments should be freely employed. A feature of ostitis is that the disease is prone to extend from one bone to another, the morbid progress being very slow; and, although operative measures be advisable, too much must not be expected of them at any one time, especially if it be known that the disease is in an aggressive state.

Caries of the tibia or other bone near the integument is to be managed much like necrosis; the dead and dying particles are to be removed with a gouge, chisel, or osteotrite, and the wound treated with weak solutions of carbolic acid. The under jaw, clavicle, scapula, olecranon, patella, and other subcutaneous osseous structures in a carious state are not difficult to reach and treat when disease necessitates operative interference.

Periostitis is generally confined to the bones nearest the skin, the covering of the tibia being oftenest affected. The disease is attended with great pain, especially during barometric changes. An effusion of plastic lymph takes place beneath the membrane, putting the dense fibrous tissue upon the stretch, and producing a lump which is hard as a node. This reparative lymph, for such it is, and akin to that utilized by the vital operations carried on during the repair of a fracture, will be transformed into an osseous node unless it be released by incisions made to set it free. The use of great heat and heating liniments may do some temporary good, yet they are merely palliatives. Iodide of potassium in large doses is the most valuable remedial agent that can be employed in the management of periostitis. The subcutaneous use of morphia is sometimes used very happily and effectively in the reduction of terrible pains arising from periostitis. A solution of chloral, and even chloroform, may be employed hypodermically when the distress is intense.

Osteomyelitis or inflammation of the medullary structures of bones, can not be readily distinguished from periostitis, except circumstantially. The inflammatory paroxysm is generally ushered in with a chill, and the pain is deep and sickening. The limb swells, and the superficial veins become distended from the fact that the deep veins are obstructed by the effusion of lymph. In the event that an abscess form in the medullary structures there is danger to life, unless an incision in the soft parts, and a perforation of the osseous case be made with a drill, to give exit to pent up pus and other fluids. Should the patient survive an acute and severe attack of osteomyelitis, the bone is in danger of necrosis.

The femur is a bone which often suffers from osteomyelitis, the inflammation beginning in the cancellated structure near the extremities of the bone. The pain and the prostrating character of the disease call for the use of anodynes, fomentations, and the hypodermic use of morphia. When the inflammatory action is near the knee, that joint is apt to become implicated; and if suppuration take place in the articulation, amputation may be required to save life.

Osteo-Sarcoma is a formidable disease of a semi-malignant type, which is liable to attack any bone in the body, though the under jaw and the scapula are, perhaps, the most frequently assailed. A hard lump forms on a bone, and increases in develment until the size of the tumor interferes with the functions of the part, and the constitutional contamination threatens life. After the character of the disease is understood, the morbid mass should be removed if possible, even if amputation of a limb be required. When the morbid development is of one side of the inferior maxillary, it may be best to ligate the external or primitive carotid, and then excise as much of the bone as may be found in a suspiciously diseased condition. Patients stand these severe operations much better than the inexperienced might suppose. One of the chief dangers is from primary or secondary hemorrhage. The suppuration is apt to be profuse, and prolonged; and a reproduction of the disease may manifest itself before the primary wound is healed.

NECROSIS.

The molecular disintegration of bone, or the death of an osseous structure in particles, which, as a destructive process, resembles the ulcerative action peculiar to the soft tissues, is a slow operation, and denominated *caries;* but a more rapid process of bone-death, which destroys considerable portions of osseous material at a time, is analogous to sloughing of the soft tissues, and is called *necrosis.*

The integrity of a long bone depends much upon the condition of its periosteal covering and its internal or medullary membrane. When these structures undergo inflammatory action, the osseous tissue becomes inflamed through sympathy of continuity, and its texture is modified by the morbid processes. Sometimes the medullary cavity is encroached upon by deposits of new bony material; at others the density of the bone is increased so that a condition of sclerosis exists; osteophytes, nodes, or scales of new bone may form on the surface of the original osseous structure;

and, finally, a considerable portion of the shaft of a bone may die, and become encased with a shell of new bony material. The latter change produces what is usually denominated necrosis.

Caries commonly attacks the spongy structures of the short, and the cancellated tissue of the extremities of the long bones; necrosis may attack any of the bones, but is prone to invade the shafts of the humerus, the femur, and the tibia. The cranial bones, the jaws, the vertebræ, the ribs, the crests of the ilia, the fibulæ, and the forearm bones, are not exempt from necrosis. The dying process in bone may spring from injuries, abscesses, tuberculosis, and especially from periostitis. When a bone—or a fragment of it—dies, the dead structure acts as a foreign body in the flesh, provoking inflammation and suppuration. The necrotic mass can not escape through the narrow sinus established for the discharge of purulent fluids, consequently it remains imprisoned a long time, and only finds exit after being partially disintegrated and dissolved by the fluids which constantly bathe its surface.

The periosteum, which is so often primarily impressed in the morbid action which leads to necrosis, is a film-like membrane, corresponding to the inner bark of a tree; and in a state of health it is pale through bloodlessness, and so dull of sensation as to undergo cutting or laceration without pain being elicited; yet when diseased or influenced by reparative activities, it passes into one of the most exquisitely organized structures in the body. In a brief period it becomes transformed into a membrane highly vascular and acutely sensitive. As soon as the dying process takes place in the shaft of a long bone, the whole energy of the periosteum is called forth, so that it assumes the greatest display of formative capabilities, and executes unerringly and promptly, its conservative protection to the limb. The original bone being dead, the periosteum commences its new function of supplying an equivalent in the shape of a bony case. It supplies an abundance of new osseous material as if it were to repair a fracture or other injury of the bone. The rapidity of the work is proved by the almost sudden shifting of the attachments of the muscles. At one moment they are attached to the old bone, and at another they are connected with the new structure, and not the smallest interval is known to pass when they are unattached to either. They suffer no moment to elapse in which they can not move and support the limb. The new osseous case springs wholly from the

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[illegible] came from

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and mature [illegible] undergo exposures to vicissitudes of

weather which would overwhelm the more impressible; and even the strong are not always capable of resisting the deleterious influences of drenched clothes, wet feet, cold draughts of air, and sleeping on the ground or without shelter, especially in miasmatic regions. Few constitutions are competent to endure the exposures incident to ordinary camp-life, without great risk of rheumatism, arthritis, and bone diseases of various kinds.

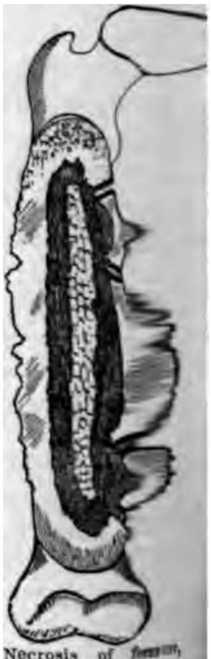
The inflammatory process which leads to necrosis is usually protracted, and attended with distressing symptoms. The attack is commonly ushered in with a rigor or chill; and soon the local disorder is announced by severe pain, which is deep and subduing, as if some serious disorder were invading the organism. The patient is usually prostrated to a degree which threatens a fatal termination unless some relief be at hand.

The management of the local and general disorder which precedes necrosis, requires patience and skill. The pain being the chief cause of complaint, the use of anodynes becomes imperative. Chloral is to be given by the mouth, and morphia may be employed hypodermically. Poultices and hot fomentations contribute some relief, and cold is rarely admissible. The swelling may render the soft tissues so tense that a free incision is followed by a mitigation of the pain, especially if the knife make a slit in the periosteum. In one case I used a drill, after the soft tissues had been divided with a scalpel, and bored a hole into the medullary cavity. The artificial opening discharged pus; and less distress was experienced from that time forward. There was not an abscess in the bone, but the high grade of inflammation had developed purulency. When pus is effused beneath the periosteum the bone is largely deprived of nutritive supplies, and may die *en masse,* so that removal of the entire bone is necessitated.

The short, spongy bones of the hand and foot often inflame; and fistulous openings discharge pus and particles of osseous material. A probe carried into the cloacæ touches uncovered bone; but it is difficult to determine whether the disease is that of caries or necrosis. In many instances the parts involved in the ulcerative action are to be let alone, or simply bandaged to obviate motion and to reduce the swelling. In several instances I have known the disease to subside without an operation, and without serious loss of structure. Of course, the patient's general health is to be kept in as good condition as possible, that the reparative powers may gain the ascendency at the earliest period practicable. When the ulceration seems to be progressive, or there is little hope of its subsiding without operative interference, an incision is to be made where the use of the probe indicates the best point; and osteotrites, gouge-forceps, and excavators, are to remove the dead and dying osseous structures which are commonly found to be spongy, and easily operated upon. The operation should be performed with due regard to the position and insertion of tendons, and the location of blood-vessels and nerves. If the principal part of the dead and dying bone be removed, the excavated spaces will in time be filled with reparative material of an osseous nature, and the sinuses will cease discharging fluids, and then cicatrize.

In many instances of bone-disease, with ulceration and the discharge of pus through sinuses, the inflammation and destructive forces are provoked by the presence of tubercles which had been deposited in the cancellated spaces. Cases of this kind have come under my observation; and I have not always regarded them as wholly detrimental. In one instance the patient was from a consumptive family, and the tubercular difficulty of the bone seemed to have diverted from the lungs a marked hereditary predisposition to phthisis.

FIG. 73.

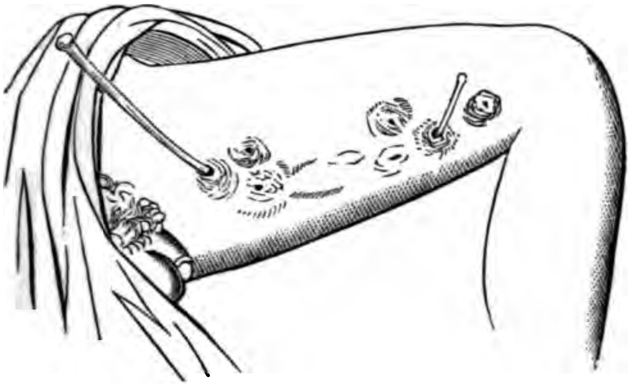


Necrosis of femur, with shell of new bone, and enclosed sequestrum.

A form of bone disease similar to that just described, is caries of the vertebræ. Tuberculous matter is deposited in the spongy spaces of the bodies of the vertebral chain; ulceration and waste of structure ensue; then, by the approach of the upper and lower plates which have resisted the disintegrating process, a bulging occurs in a backward direction, as instanced in Pott's disease of the spine.

The death of the diaphysis or shaft of a hollow bone, constitutes a marked form of necrosis. As indicated in another place, it comes from periostitis or osteomyelitis (endostitis, or inflammation of the medullary membrane), or both. The epiphyseal extremities of the bone may not be primarily impressed by the morbid action, though they are not likely to escape the later phases of the disease. The inflamed and thickened periosteum furnishes new osseous material as it does in the formation of callus in the repair of a fracture; the new bony matter consolidates in layers which constitute a cylindrical shell to enclose the necrosed diaphysis that becomes a sequestrum. The dead and imprisoned bone becomes reduced in size by the solvent action of the pus which surrounds it, and the detritus is carried through the cloacæ which are left in the shell of new bone, and serve as outlets for the purulent fluids. The inner surface of the shell of new bone has no medullary membrane, as that which exists in the hollow of the original bone, but a layer of granulations which multiply and fill the cavity occupied by the sequestrum as soon as that foreign body is extracted or exfoliated.

FIG. 74.



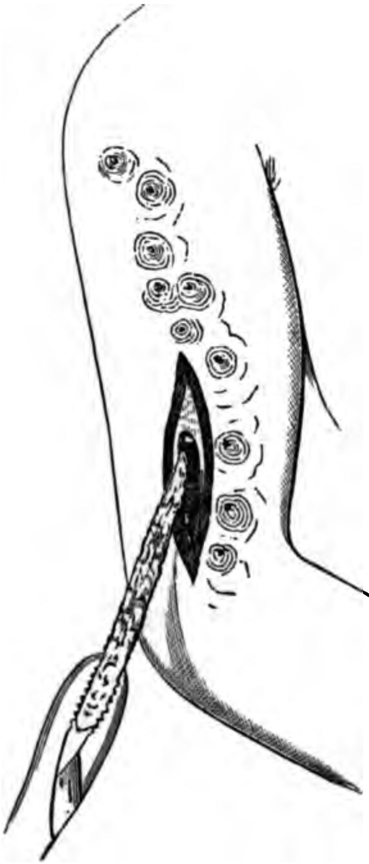
Necrosis of femur—with bougie passed through sinuses.

The time required for a sequestrum to form is perplexingly long, months and even years being consumed in the process; and there is seldom anything gained, and often time lost, and trouble increased, by too early attempts to remove a sequestrum which is not "ripe" or matured, and fully detached. And the time needed to repair a cavity from which a sequestrum has escaped or been extracted, is also perplexingly tedious, as a year or more may be required in the reparative process. In some instances a fistulous track leading to the cavity always remains, and occasionally discharges a thin fluid.

During the progress of necrosis some of the cloacæ or fistulous openings become obstructed. This state is followed by an outbreak in a new place, pain and fever attending the opening procedure. On a limited scale, here is an imitation of volcanic action. When the cloacæ become choked, tumults are provoked within, and the imprisoned fluids force new ways of escape. A leg or an arm which contains necrosed bone a number of year will generally exhibit several cicatrices to indicate where sinuse have existed. Often a new fistula forms near the site of an old one

The annoyance attendant upon necrosis is exceedingly great The suffering limb has to be frequently dressed, on account of the profuse discharge from the fistulous openings; several thick nesses of old muslin become literally soaked with pus in a fe hours. And the fœtor arising from the putrescent fluids di charged from sinuses in bone, is peculiarly offensive. A patien with necrosis of one of the bones of the leg can not remain i an ordinary room five min utes without polluting th air with a disgusting scen

FIG. 75.



Necrosis of the humerus; and operation for the extraction of the sequestrum.

It is a common practic among those who have littl courage to perform a surgi cal operation of considera ble importance, to attemp the cure of necrosis by i jecting medicated fluids int the fistulous tracks whic lead to the sequestrum. I the cavity would bear th presence of a fluid whic could dissolve dead bon there might be some reaso in an effort to thus get ri of the offending body; bu any active solvent of dea bone would prove destruc tive to the living tissue The injection of a wea solution of carbolic aci into a carious cavity ma favor the disengagement o dead particles, and the r production of new bon It does little good to inje a cavity containing a s questrum.

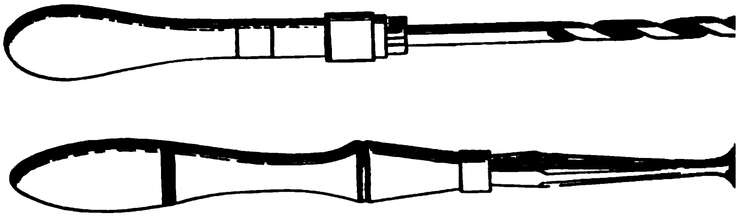
The differential diagnosis of caries and necrosis is not always easy, yet it is quite important to make the distinction if possible. In a case of caries the discharge is thin and ichorous, and in necrosis it is ordinary pus. A probe can generally be pushed into the spongy structure of carious bone, while in necrosis a loose piece of bone may be discovered by the skillful use of the probe. If it be found by probing that the sequestrum is not detached there is no certainty that it may safely be removed by an operation. As a rule the sequestrum is not loosened and detached until a firm shell of new bone is thrown out around it, to give support to the limb when the sequestrum no longer lends its aid. Small sequestra which become detached from the main piece, often escape spontaneously through cloacæ; and the largest piece will come out after it has been sufficiently reduced in size to pass through the largest opening in the newly formed case or shell. The tendency is to a spontaneous cure; and the surgeon merely hastens the process by artificial means. If he begin his operative measures too soon, he is meddlesome; if he delays too long, he wastes time that might have been saved. Besides, the presence of a sequestrum in the centre of a limb has a damaging effect upon the constitution. Albuminuria, and Bright's disease of the kidneys, have been induced by a prolonged suppurative action in the medullary cavities of the larger bones.

SEQUESTROTOMY.

The operation for the removal of sequestra that have become loosened in the progress of necrosis, is very appropriately called sequestrotomy. It consists in making an incision an inch or more in length along the course of the track where the prominent fistulæ exist, and then clearing the space down to the shell of new bone with the finger or a *raspatorium*, as the instrument, fashioned like an elevator employed in trephining, is called. At a point where the largest cloacæ exist a drill or small trephine is to be used to bore a hole in the case or shell of new bone. If one hole is not enough others may be bored close together in a row, and then a chisel or gouge-forceps may be employed to cut the bone between the holes, so as to establish an elongated opening which will admit the finger. The sequestrum may then be felt, and having been grasped with forceps may be extracted.

The instruments ordinarily recommended for sequestrotomy are not the best for the performance of the operation. A trephine, though moderate in size, is too large. Often the operatio has to be executed near important nerves and blood-vessel where space for the crown of a trephine can not safely be obtaine It is therefore better to use a hand-drill which cuts a hole a thi of an inch in diameter; and does not bruise nor lacerate t

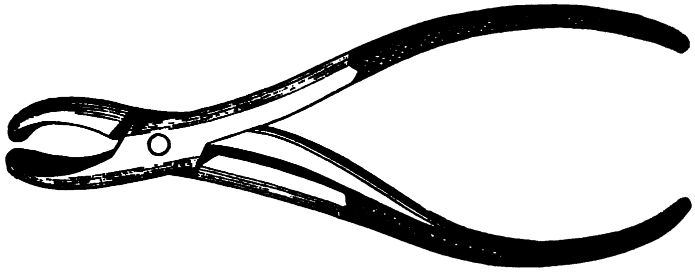
FIG. 76.



Upper instrument represents a hand-drill for boring bone; and the lower is an osteotri for enlarging openings and cutting carious bone.

flesh. The drill is shown in the diagram at about one-third si It bores rapidly, and quite cleanly brings out the chips. Wi this instrument I can bore three or four holes while one is ma with a trephine. The handle is so constructed that, with the u of a wrench, drills of different sizes can be employed. A sma one may be used to freshen the calloused surfaces of the fragme of a false-joint, instead of Brainard's awl or drill.

FIG. 77.



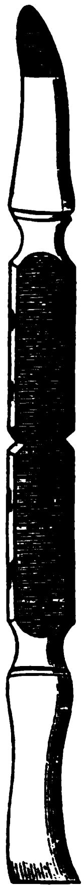
Gouge-forceps for excavating bone.

I also employ an osteotrite (reamer) to enlarge cloacæ in bon or the holes made with the drill. When the bone is too hard be cut with bone-forceps, the osteotrite is exceedingly useful.

When a chisel is needed, the ordinary carpenter's tool is t slender and brittle, consequently a steel chisel made for the pu pose by surgical cutlers is the most reliable. Sometimes this h to be driven with a small mallet when it becomes necessary t chip off a projection of bone, or to open the way between clos or holes which have been drilled or bored in the dense shell of new bone.

When necrosis has existed for ten or fifteen years, the sequestrum may have nearly vanished by escaping piecemeal, or in particles, consequently the surgeon finds little to remove after making an opening into the cavity where the necrosed bone once existed.

FIG. 78



Raspatorium, excavator, and elevator.

And if the operation be performed too early, more or less difficulty will be experienced in attempts to extract the partially disengaged sequestrum. It may be necessary to enlarge or elongate the opening in the shell of new bone, and use the osteotrite, gouge-forceps, and raspatorium, to break down, loosen, and remove the firmly incarcerated sequestrum.

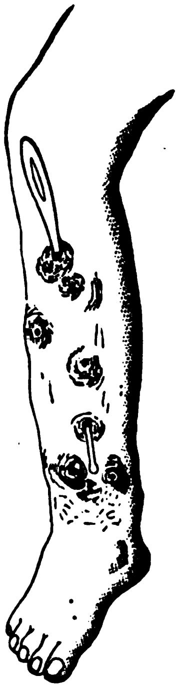
The hemorrhage attending sequestrotomy is generally not important. If considerable bleeding is feared the elastic bandage and rubber tubing of Esmarch may be employed. I have never encountered troublesome hemorrhage in but one instance; in that the blood came in jets from an enlarged articular artery near the elbow, which got divided while performing sequestrotomy upon the humerus, the condyles being involved in the necrotic process. However, after pinching and twisting the vessel with forceps, the hemorrhage ceased.

Some care should be exercised in making the primary incision along the fistulous and cicatricial track when cutting upon a necrosed humerus or femur, lest the main artery of the limb be laid open, for the contraction attendant upon cicatrization may have dragged the vessels to one side of their usual course.

After the sequestrum has been dislodged, it is generally not good practice to gouge and scrape the inside of the shell which is studded with fresh granulations put forth to fill the cavity. The cancellated structure near the ends of the bone may be carious, and therefore needing the use of the raspatorium to clear away the dead and dying spongy structure. However, the scrapings should be washed, examined, and smelt of, as they are removed, to avoid excavating healthy structures which from their porous nature may be easily scraped away.

After the sequestrum has been removed, and the cavity it occupied is washed out, the operation is complete, and nothing more can be done, except to keep the opening in a condition to facilitate discharges. There is no necessity for employing the rubber drainage tubes recommended by Chassaignac. The cavity gradually fills with granulations which become studded with osseous material. No medullary membrane is reproduced, nor does the new internal bone become as hard as the outer shell. The work of repair may extend through a period of several months, or even a year or two. Often the joints nearest the disorganized bone are morbidly sensitive and impeded in their movements, but in the course of time these annoyances will cease.

FIG. 79.



Necrosis of tibia—common probe carried through sinuses.

When the flat bones undergo necrosis, the dead osseous structure will generally exfoliate without a shell of new bone forming around it. Sometimes the outer table, as of the skull, will exfoliate, and the waste is never supplied. In such cases the soft tissues closely adhere to the living bone, and an indentation is left where the exfoliation took place.

When an entire bone becomes necrosed, amputation may be necessary, unless the bone be one of the carpal or tarsal groups. I have removed short bones from the hand and foot, without seriously impairing the functions of the extremity operated upon. If the periosteum can be saved wholly or in part, new bony material may be furnished by the periosteal membrane. The osteogenic powers of the periosteum were clearly demonstrated by Ollier of Lyons. However, the experiments of this distinguished surgeon and physiologist were made chiefly upon rabbits and the lower animals; and the same degree of success has not been attained when their repetition was tried upon man.

The fracture of a bone undergoing necrosis is sometimes followed by serious complications, while in a few instances I have observed that consolidation took place much sooner than union occurs in healthy bone.

In a case of extensive necrosis of the tibia, as represented in the accompanying diagram, I cut a channel from a point an inch below the knee to the immediate vicinity of the ankle. The channel was wide enough to admit the finger, and was made by boring through the shell of new bone with the hand-drill, and cutting the intervening spaces with a bone-chisel and gouge-forceps. The medullary structure was in a state of necrosis, though there was no evidence of an attempt to form a sequestrum. The raspatorium was employed to remove the cancellated material. Six months after the operation the gutter had filled with reparative material of an osseous nature. The cure was complete, there being no fistulous opening, and no pain in the limb. The operation was performed before the class as a clinical case. The patient was a young man from Arkansas, and he is now engaged in daily labor.

I once performed sequestrotomy upon the femur of a man who had suffered from the effects of necrosis for more than twenty years. The incision was made on the inside of the thigh near the femoral vessels; and the encasing shell of bone was perforated with the hand-drill; and the hole enlarged with gouge-forceps. The sequestrum broke in being removed, but there was no difficulty experienced in seizing and removing the second fragment. This was also a clinical case, and the patient entirely recovered in less than a year.

Some years ago I removed a short sequestrum from the femur of a fleshy individual who sustained an injury of the thigh bone from a bullet. The patient made a good recovery.

A ring of dead bone sometimes forms after an amputation, the saw doing such injury as to favor the dying process. In such a case, the dead piece of bone is to be removed by making an incision in the stump, and disengaging the exfoliating mass. In some instances, re-amputation may be necessary.

CURVATURE OF THE SPINE.

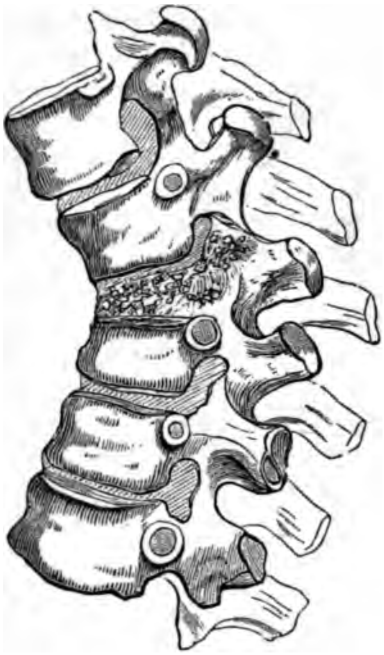
Two varieties of spinal curvature present themselves—the *angular* and the *lateral*. The first mentioned is the result of caries in the body of a vertebra, the disintegrating process causing the bone to crumble, so that a short incurvation ensues, a segment of the column projecting backward; the second arises from a laxity of ligaments, or a swaying of the vertebral chain into long curves.

Percival Pott, an English surgeon, having called particular attention to the angular variety of the disease, his name became attached to the malady, hence we say "Pott's curvature of the spine." The deviation is generally in an antero-posterior direction, and is marked by a lump or tumor which is made up of projecting processes of the carious vertebræ. It may be seated in the cervical or lumbar region, but the dorsal vertebræ are oftenest affected. The unprofessional name for the disease is "hump-back."

The cause of Pott's disease of the spine may be a severe strain or concussion, though it is generally ascribed to an enfeebled state of the body, to scrofula, and to tuberculosis of the bone. Caries, coming from whatever cause, is the essential feature of the disease. The morbid action by which the bodies of vertebræ and fibro-cartilages are disorganized, is identical with that which destroys joint-structures of the carpus, tarsus, and spongy ends of long bones. The disease may commence in the vertebral articulations, and then extend to the osseous structures, as in hip-disease, but in the majority of instances the body of some vertebra is primarily attacked with ostitis, softening and disintegration then occur, and the supra-incumbent weight of the head and shoulders crushes the fragile bone. The middle of the anterior wall of the diseased vertebra, where the structure is weakest, yields, and the firmer and less fragile upper and under lamellæ fall together. This collapse of the body of the bone is necessarily followed by a projection backwards of the spinous processes at that point, constituting the apex of the angle.

The early symptoms of disease and angular curvature of the spine are not well pronounced. A child may engage in plays and go to school for weeks after the morbid action is established, and the mother not suspect anything wrong. But at length a tired feeling and aching sensations will be complained of in the back, and there will be manifest a disposition to avoid stooping, jumping, and rough sports. These peculiarities attract the attention of the mother; and upon examination she discovers a tender place in the dorsal region, and observes that the bones project at that point. Now the family physician is summoned, who, after due consideration of the case, declares that the evidence of Pott's disease of the spine is unmistakable, and calls attention to the abrupt angular eminence in the vertebral chain. This is a distressing verdict for parents and friends. All know what a misfortune is impending. The hope of cure is not strong, and the fear of lasting deformity is appalling. The prospect for the child to attain maturity and support itself is not flattering; and the probability that every feature of the body is to become misshapen and unsightly is horrible to contemplate. A well proportioned trunk contributes largely to human beauty as well as comfort. Heather Bigg, in his work on the *Deformities of the Human Frame,* says: "In the great museums of ancient art there are treasured *torsos* over which the sculptor and the artist dwell with inexhaustible rapture. Limbless, headless, these sculptured trunks are big with an indefinable grace and beauty which set at naught the ravages of time. The imagination, as the eye rests on the genius-wrought marble, readily supplies the wanting parts, and an inspired whole, rather than a mutilated fragment, occupies the mind.

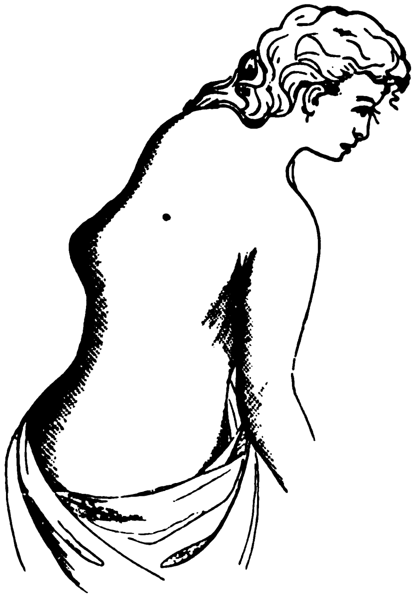
FIG. 80.



The body of a dorsal vertebra softened and crushed, producing angular curvature of the spine.

"Not such, however, is the effect produced by a sculptured head or limb. Both may enlist our admiration for their independent beauty, but neither the one nor the other enables us to build up in the imagination that exquisite carriage which is the distinguishing beauty of the human frame. This carriage is mainly due to the trunk; and the relation of the head and limbs to it, apart from the trunk, is slight. Half an hour's ramble among the ancient sculptures of the British Museum, the Louvre, or the Vatican, would furnish proof of this statement.

Fig. 81.



Angular curvature of spine in the dorsal region.

"It is not surprising, then, that, as a defect of symmetry alone, distortion of the spine should have acquired precedence among deformities. Wryness of the vertebral column is fatal to the symmetry of the trunk, and to that exquisite harmony of parts which consititutes the beauty of a sculptured *torso*. Often, also, spinal curvature is connected with deformity of the extremities; and when aggravated it renders the unhappy sufferer the most wretched of cripples."

Angular curvature of the spine is always backwards; and if it occur in the dorsal region, two other curves, one above and the other below the first, are sure to follow. However, these are not the result of irritation, inflammation, and caries, but are compensating curves which arise from necessity; the poise of the head on the vertebral chain, and of the trunk upon the legs, forces these secondary incurvations. If a patient with curvature in the dorsal region be observed critically, it will be seen that the lumbar curve is exaggerated, and that the promontory of the sacrum is thrown forward while the lower extremity is turned backward; and it will also be noticed that the natural cervical curvature is thrown forward, at the same time the head is tilted backward—the patient casts his face up, and throws his chest forward, as if assuming a lofty demeanor. The original curve, by the collapse of a vertebra, shortens the stature of the individual, and the compensating curves lessen his stature still more, so that patients afflicted with Pott's disease of the spine are always diminutive in height.

Owing to the falling forward of the spinal column above the angle, and its carrying the ribs with it, the sternum projects, giving to the cavity of the chest greater antero-posterior capacity, yet the shortening which occurs in the vertical direction, diminishes the thoracic space in a compensating degree. The forward projection of the lumbar vertebræ produces a pot-bellied appearance to the individual, which is also increased by the shortening of the trunk.

The viscera of the chest and abdomen are considerably disturbed by changes in the skeleton, yet, being soft, they yield readily and accommodate themselves to their new positions and relations. The aorta is bent at the site of the vertebral angle. Some difficulty of breathing may be experienced in the progressive stages of the disease, yet in the course of time little inconvenience from that source is felt. In this connection it may be remarked that the spinal cord may be impinged upon by the angular curvature of its osseous girdle; and if such be the case a greater or less degree of paralysis is produced in the organism below.

It is not uncommon for suppuration to take place in the carious and crumbling vertebra, producing an abscess which, having no ready course of evacuation, may discharge into the thoracic or abdominal cavity, and be instrumental in producing death. An able writer on the subject, remarks: "Deformity is an affliction for which the sufferer may be commiserated; paralysis of both lower extremities claims our sympathy; but it is from the effects of large abscesses that patients may be expected to die."

Caries is an ulcerative disease of bone, pus being one of the products; then, it will be asked, why is an abscess not always present in carious disease of the spine? Undoubtedly pus is always produced, but in many instances the globules undergo disintegration and then are absorbed, as we know pus may be disposed of in other forms of disease. Spinal abscesses occasionally break into the trachea, bronchi, stomach, intestines, and bladder, and the discharge may escape observation. After the pus is discharged the cavity it occupied is filled by reparative action, and no trace of an abscess remains.

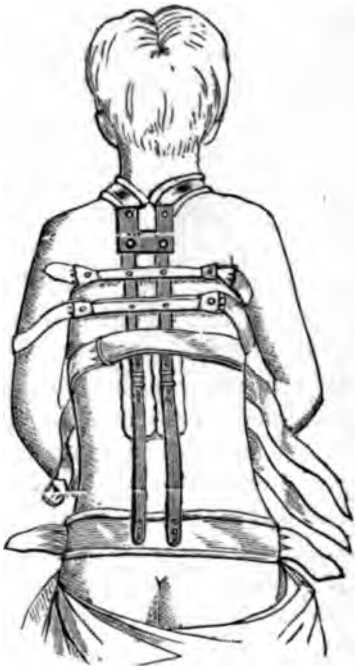
In what are called psoas or lumbar abscesses, the body of a vertebra is generally in a carious or ulcerative state; and the purulency finds its way through the walls of the abdomen at the loins, or following the sheath of the psoas muscle to the inside of the thigh, gets an outlet there. It is a mistaken notion that psoas abscess springs from the psoas muscle or other soft structures in its vicinity.

A prominent method of cure in Pott's disease of the spine is by consolidation of the upper and under lamellæ of the collapsed vertebra, and of the contiguous bones. After the ulcerative stage of the disease has spent itself, reparative action sets in, which is not essentially different from that attending the repair of a broken bone. New ossific material is deposited around the seat of caries or disintegration, forming bridges between contiguous vertebræ, and consolidating them as the fragments of a fractured bone are united, the result being ankylosis of the affected vertebræ.

The treatment of patients suffering from caries of the spine and spinal curvature, is not essentially different from that which has proved useful in the management of morbus coxarius, synovitis, and kindred diseases of the joints. Remedies are to be selected with the design of improving the condition of the stomach. Physical vigor comes not from stimulants but from well digested food. It is easy to talk about restoring physical vigor with rich articles of diet, but they avail little unless well received by the digestive apparatus. Nor is the process of converting meat and bread into human tissues completed in the stomach. The absorbents along the intestinal track, which may be in bad condition, must take up the digested pabulum and still further elaborate it, or when poured into the blood it is unfit to be assimilated, and must go out of the body as waste material. A cup of gruel well digested and elaborated before entering the blood imparts more strength than a badly digested roast of beef. An enfeebled body, harassed with pain and fever, is often weakened by the injudicious employment of tonics, and the intemperate use of rich food.

A young person suffering from caries of the spine, is not unfrequently the victim of intestinal parasites. So often have I learned this to be the fact, that in almost all cases I prescribe with that idea in my mind. I give suspicious cases sulphur in broken doses, or on occasional days, not losing sight of the idea for months or years, if the patient needs treatment that length of time. "Acid solution of iron" in three or four drop doses, repeated every three hours, every other day, is another favorite remedy. Syrup of lacto-phosphate of lime, with a drop of Fowler's solution in each dose, and given in teaspoonful doses on alternate days, with the ferruginous solution, is still another remedy which can be relied on to develop vital activity. But medicine alone will not accomplish much; rest is to be enjoined, and the resources of art brought into use. The angular projection must have a depressed spot in the bed or mattress, for pressure upon it is both unpleasant and injurious. A belt around the hips is to have cords reaching to the foot of the bed and there fastened, while the lower end of the couch is to be elevated by placing blocks under the foot-posts. This arrangement exerts extension and counter-extension upon the vertebral column, and counteracts the contractile force of the

FIG. 82.



Taylor's apparatus for treatment of angular curvature of the spine.

spinal and abdominal muscles. The patient soon gets used to the attitude; and rarely complains of it. A pillow can be used to elevate the head comfortably. Should the posture become irksome, or a change of position be desirable, the extending and counter-extending forces can be transferred to the other extremity of the trunk. Adhesive strips two or three inches wide are to be attached to the dorsal and pectoral regions, above the morbid angle, and then, with the bed inclined the other way, the strips are to be fastened to the head of the couch, so that the patient's weight is sustained either wholly or for the most part. While treated in either of these attitudes, the patient is to wear a firm and nicely fitting corset that twisting and lateral motions may be obviated. If the patient have a bed-frame made with reference to size, condition, and application of the mechanical principles referred to, he can, in fine weather, pass time in an arbor, or where fresh air may be obtained in abundance. After this course of treatment has been followed until there is evidence of recovery through ankylosis of the diseased vertebræ, the patient can leave the bed and wear a spinal apparatus made in accordance with principles displayed in the previous management. A firm and well fitting girdle rests upon the hips; and this supports lateral pieces which terminate in crutch-like tops that sustain the shoulders by having fastenings there. Several surgical mechanicians in the country make and apply spinal apparatus; and no one has yet succeeded in the combination of mechanical principles which calls for special mention on my part. It is to be borne in mind that the apparatus steadies the vertebral column, takes weight from the diseased vertebræ, and tends to obviate shortening of the trunk; but it never restores the patient to his original shape.

Lateral Curvature of the Spine.—"Antero-posterior curvature of the spine" is characterized, as has been stated, by caries and collapse of the bodies of one or more of the components of the vertebral column. Another variety of spinal curvature is that in which the deviation takes place without disintegration of bone or loss of structure, and the curves are right and left from a perpendicular, consequently the incurvation is called *lateral*.

It is an affection of a passive nature, and occurs during the period of active growth. It is devoid of pain or disorganization, though it may be attended with lassitude or debility. The curves are gentle and symmetrical, and in their earlier manifestations may not be marked. An awkwardness in the figure and movements of the patient may be the first symptom that attracts attention. On a close examination of the spine a curve is perceived on one side or the other, and the shoulders begin to lose their relative positions, one is unduly elevated, and the other correspondingly depressed, and they become twisted on the convexity of the ribs.

The primary curve commonly occurs in the dorsal region, and the deviation is to the right, while the secondary or compensating curves are in the cervical and lumbar regions, and deviate to the left. All the curves give the vertebral column somewhat the appearance of the italic *S*.

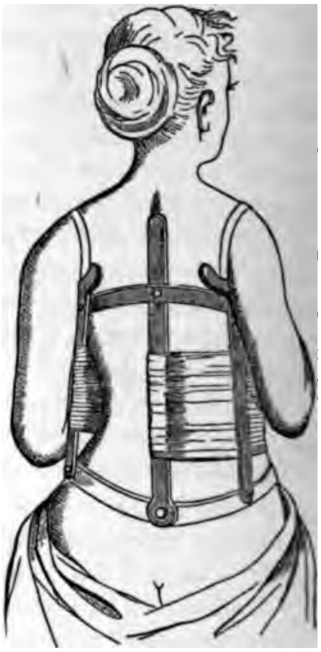
In connection with the dorsal deviation there will always be some distortion of the ribs and sternum, constituting malformation of the thorax. The sternum, especially its lower extremity, swerves to the left, or opposite to the direction or convexity of the dorsal curvature. The side of the thorax, corresponding with the last mentioned curve, sinks lower than the other, approaching the pelvis; and when there is considerable spinal deviation, the false ribs reach the ilium, and even project into the iliac fossa of that side.

In some instances the costal cartilages and the bent sternum project forward at an acute angle, presenting what is called the "chicken-breast;" in other cases the sternum is bent in the opposite direction, greatly diminishing the antero-posterior diameter of the chest. The thorax being also twisted, its cavities are of unequal size, so that the viscera do not move easily, asthma and cardiac disturbances being the result.

Various influences have been assigned as the causes of lateral curvatures of the spine. Muscular weakness has been considered the principal cause of the distortion; though laxity of the ligaments and yielding of the intervertebral cartilages contribute to the defect. In most instances, however, it is more rational to ascribe the vertebral deviation to an enfeebled digestive system, as in Pott's disease. Rachitis is generally the effect of a disordered alimentary canal. Curvature in connection with rickets occurs at an early period of life, and affects both sexes equally; but uncomplicated with rickets lateral curvature is restricted almost exclusively to females. The disease appears between the tenth and fifteenth years, or at an age beyond that in which rickets and angular curvature of the spine prevail.

So far as original life-force is concerned, both sexes are brough into the world with equal chances of reaching mature and perfec development; but before the age of twenty the majority o females raised in fashionable society are subject to influence which fasten upon them a greater or less spinal deviation. I communities where both sexes are allowed the same amount o out-door exercise, females have as erect vertebral columns a males. But in the city the little misses are confined a great portion of the time in overheated and unventilated apartments, are permitted a pastry diet, and are cramped with appliances employed to give a stylish turn to the waist. Under such influences the wonder is that so many acquire well-developed and symmetrical bodies. The dress of young females is often such as to restrain the muscles of the back and the movements of the shoulders; and the lack of proper exercise is followed by lassitude of spirits and laxity of the fibrous tissues.

FIG. 83.



Lateral curvature of the spine, with apparatus for its cure.

The treatment for lateral curvature of the spine that amounts to a marked deformity, consists in the use of an apparatus which counteracts the tendency to sway on the part of the vertebral column. A steel girdle rests upon the hips, and tw lateral uprights hinged to the base, extend to the axillæ ar terminate in crutch-like extremities. The length of these can modified by slides and screws; and the shoulders of the patie are fastened to the uprights with elastic bands. A dorsal uprig is also hinged to the girdle below, and reaches to a point betwe the shoulder blades, and is there held in place by a band whi surrounds the chest, and has a fastening to each upright of ste An elastic belt, six or eight inches in width, reaches from t dorsal upright three-quarters of the distance around the chest the right or left lateral upright, as the curvature may demand, the belt passes under the upright on the side an attachment is not made. It will be seen that such an apparatus transfers a part of the weight of the head and shoulders from the vertebral column to the hips, and tends to press the lateral bulge toward the vertical line.

In addition to the mechanical means employed to restore the body to its normal shape, something should be done to establish a vigorous state of health. Unless movements be attended with pain, out-door exercise should be taken every day. The food should be easily digested and sustaining. Mountain, lake, and ocean travel, with the change of air and diet attendant upon excursions, generally proves highly beneficial.

As a preventive of spinal diseases there is nothing more effective than an active physical training. Among the ancients the Greeks were the best developed, and acquired the most perfect forms. The secret of their bodily symmetry consisted in the attention given to gymnastic exercises. The youth were regularly trained in athletic games, and schools for this purpose were supported at public expense in all the towns of Greece. The consequence was that few physical deformities were known among that celebrated people, and nearly all enjoyed that greatest of earthly blessings, sound bodily health.

SECTION IX.

ARTHRITIS, AND DISEASES OF THE JOINTS.

JOINT diseases are peculiar from the fact that an articulation has in its organization several distinct structures, which differ so widely in their nature that when affected by morbid action the phenomena are of a mixed character, no one appearing distinct or specific, but all are modified and more indistinct than in the disease of a less complicated piece of organism. The *bones* and their immediate coverings are affected in joint diseases; also *cartilage* and *interarticular-fibro-cartilage* when it exists, *ligaments*, and *synovial membranes*, to say nothing of connective tissue and adipose material. Nor can we leave out of the summary, the forces brought to bear upon a diseased articulation by the muscles which hold the bones in articular contact, and the effused fluids which tend to rupture the ligaments and put the muscles and tendons on the stretch.

Formerly it was customary to call inflammatory disease of the hip-joint "morbus coxarius," and a similar disease of the knee-joint "white swelling," and a scrofulous or strumous state of the body was presumed to be the cause or foundation of such affections, whether manifest in the hip, knee, ankle, or elbow; and under this false impression the victims of articular diseases and unwise advisers, had to swallow an indefinite amount of cod liver oil. But, fortunately for the human race, and for the reputation of surgery, some improvement is being made in the pathology and treatment of joint diseases. A philosophical spirit has instituted a series of inquiries into local conditions, and less importance is given to indefinite terms, like scrofula and struma. It is found that joints are rarely diseased unless subjected to undue violence—the synovial membranes may have been pinched, the ligaments strained, or the cartilages crushed, or the bones shocked, to an extent that irritation, inflammation, and suppuration follow.

The synovial membranes are sensitive and vascular, and so situated that they are constantly exposed to violence. In a normal state they secrete a thin fluid which serves the purpose of lubrication to the articular movements; and they absorb the fluid when it has served its purpose, so that an equilibrium of quantity is always preserved—there never being too much nor too little. But when a morbid action is introduced by injury, the secreting and absorbing functions are modified, there is now a paucity of fluid or an excess; and its consistency and lubricating qualities undergo modifications which in themselves foster disease. An over-accumulation acts as a distending force which produces pain, and this provokes vascular congestion, and so the morbid processes go on, one evolving and aggravating another.

The synovial membranes of some of the joints, especially those of the knee, have fringes or vascular processes which are presumed to be active agents in the production of synovia; and they have non-vascular projections which may be instrumental in the development of "loose cartilages" occasionally found in the joints.

SYNOVITIS.

Inflammation of the synovial membrane, either acute or chronic, is an exceedingly common joint affection. It may arise from mechanical injury, or from excessive exercise, or exposure of the joint to impressive atmospheric changes; and it may come through invasion, adjoining tissues being first involved in inflammatory disorder.

Synovitis may be the sequence of a constitutional disturbance, as disordered digestion, or the accumulation of uric acid in the system. The "gouty diathesis" may be cited as an example; and it may arise from another systemic condition which passes under the name of "inflammatory rheumatism."

Synovitis which is acute at first may gradually pass into a chronic state, and terminate in disorganization of the joint structures, or result in ankylosis. In some instances the joint is stiffened by a thickening of the synovial membrane, a condition which may last for life, or become somewhat mobile in the course of a few years. A joint which has long suffered from synovitis, whether acute or chronic, commonly yields a distinct crepitus when forced into a mobile state. This sound comes from breaking up partial adhesions, and from the separation of layers of pulpy synovia.

The treatment for acute synovitis must be governed somewhat by the cause. If it arise from an injury, rest, evaporating lotions, and anodynes, constitute the chief agencies in hastening a cure; but if the inflammation depend upon a gouty or rheumatic diathesis, topical remedies will avail little until a better systemic condition has been established. Colchicum is one of the most efficient agents to overcome a gouty condition of the system, though attention must be paid to diet and peptics. No special reliance can be placed upon acids or alkalies, for as such they do not continue in a stomach which exerts a catalytic effect upon all chemicals thrown into it. The influence of nux, pepsin, sulphate of magnesia, acid solution of iron, quinia, and the iodides, is generally curative, yet only one medicine should be given at a time. The administration of several remedies in one day, rarely accomplishes anything satisfactory, especially as it can not be known what agent does the good in case of improvement.

Synovitis arising from inflammatory rheumatism is also to be restrained by the use of internal remedies; and macrotys is one of the most valuable of remedial agents. In addition pepsin must be used, also sulphate of magnesia in small doses (a grain every three hours), and iodide of potassium in large doses (thirty grains every four hours). Certain mineral waters, change of location, diet, and general habits, sometimes contribute largely to a cure. Young persons frequently recover upon arriving at puberty. Sea bathing has wrought wonderful changes for the better; and, also, hot baths employed with discretion. The waters of thermal springs have effected marvelous cures, though change of scenery, climate, diet, etc, may have deserved a part of the credit. Sulphur waters drunk freely have benefited patients suffering from rheumatic difficulties.

A joint affected with synovitis should be placed in a state of complete repose, and kept so for days, weeks, or even months, especially if the cause be of a violent nature. Local depletion, either by leeches or cupping, as often does harm as it effects good, therefore it is too uncertain an agency to be commended. Poultices and fomentations are also unreliable agencies, though they rarely do severe harm. Cold applications generally do good, and seldom act injuriously. The pouring of water upon an inflamed elbow, wrist, knee, or ankle, has been attended with happy results. The process should be kept up twice a day for weeks, or as long as any benefit came from the treatment. The hypodermic injection of morphia below the affected joint has often afforded temporary and even substantial relief. Blisters rarely do good; and counter-irritation is of little use. Ointments and plasters, unless charged with anodynes, are worthless. When recuperation is slow, *time* is necessary to effect a cure.

An affection of one or more joints, commonly the knee or elbow, arising from excessive secretion of the synovial fluid, is denominated *hydrops articuli*, or joint-dropsy. The fluid closely resembles that which is developed in ordinary ascites or hydrocele, yet it is modified synovia, and is a production of the synovial membranes. The super-secretion of a synovial bursa, as in "miner's elbow," and "housemaid's knee," is quite like hydrops articuli. The morbid complication does not seem to depend upon a high grade of synovial inflammation, but rather upon prolonged irritation. It does not attend, but may follow an acute attack of synovitis. A joint exposed to cold, or slight violence, may become distended with a superabundance of synovial fluid. A peculiarity of the morbid condition is that the fluid accumulates very rapidly, and forms a tumefaction in and about the articulation, the limits of which are those of the synovial capsule. The nature of the accumulation is ascertained by placing the hands above and below the tumor, and causing fluctuation. In hydrops articuli constitutional symptoms are wanting, but if the fluid be purulent the systemic impressions are marked. The use of an exploring needle will unfold the nature of the disease. The prognosis of joint-dropsy is not unfavorable, yet the disease is liable to recur as other dropsies are.

The treatment consists in strengthening the general organism by favorably impressing the stomach with peptics, nux, iron, and mineral acids; and in local applications. Strips of blistering plaster may be placed about the joint, and solutions of iodine or of the iodides may be employed as washes. Strapping with adhesive plaster has proved valuable, so have elastic bandages. A rubber knee-cap is an excellent remedial agent. In cases that obstinately refuse to improve under the treatment indicated, the distended synovial sac should be punctured with an exploring or aspiratory instrument. If much fluid be found, the most of it may be aspirated or drawn off. The point to be selected for puncture is above and external to the patella when the leg is in an extended position. The skin may be cut to a slight extent with a sharp knife; the needle meets with resistance in entering the integument. The exploring and evacuating instrument is forced in obliquely or not directly upon the articular cartilage. After the fluid is drawn off the leg and knee should be bandaged and kept at rest for a few days; and after exercise is allowed the elastic knee-cap should be worn. If a re-accumulation occurs, the second operation consists in drawing off the fluid, and injecting a drachm or two of the tincture of iodine, at full strength, into the synovial cavity. This may arouse moderate inflammatory action, and produce such other changes as will arrest excessive secretion of the synovial membrane.

What surgical writers have denominated scrofulous synovitis, is not essentially different from the simple synovitis already described, except perhaps that it is modified by its existence in strumous patients. But almost all young subjects who are affected with synovitis arising from some species of violence, at length take on the features of scrofulous patients; they become pallid, lean, delicate, sensitive, dyspeptic, bright-eyed, and anæmic: consequently the strumous features may be a sequence instead of a cause. It is said by Barwell, and other experienced observers of morbid tissues in diseased joints, that in scrofulous synovitis the membrane presents a softened, thickened, and pulpy appearance which is not found in synovitis arising from violence in robust subjects. Even if this be true, it does not necessarily follow that an otherwise athletic individual who is reduced by chronic synovitis, may not at length acquire a pulpy synovial membrane and gelatinous secretions in the affected joint.

Synovitis of a scrofulous nature, whether originally such or not, after continuing weeks or months, may exhibit a recuperative tendency, and terminate in recovery, few, if any, of its effects remaining; but it is as likely to become more and more grave, the cartilages dissolving, the bones taking on ostitis, suppuration setting in, granulations springing up in the joint, and sinuses forming in the coverings of the articulation to establish drainage. When the last stage is reached carious bone may need incisions to facilitate the escape of fluids. Ankylosis is one of the ways to recovery, and should the patient live long enough, such a termination may be expected.

The treatment for a scrofulous synovitis is substantially the same as for acute and chronic forms of the disease which come from violence. Attention is to be directed to the alimentary track—digestion should be promoted by the use of iron, nux, sulphur, and mineral acid. If the breath be bad, and it generally is in this disease, remedies just named will usually remove the cause of the offensiveness. In children a protuberant abdomen will commonly be noticeable; and a marked restlessness will exist at night, arousing the suspicion that intestinal parasites exist, which may be the case. At any rate, it is prudent to administer sulphur and santonine for such a condition. If no worms be expelled, the remedies will do no harm, and generally good. When patients improve from the use of cod liver oil, the benefit arises chiefly through the parasiticidic influence of the remedy.

Persons advanced in life occasionally suffer from *rheumatic arthritis* of a chronic nature, which is ordinary synovitis at first, but in time becomes chronic arthritis. This is one of the worst forms to cure, age probably being the obstacle to successful medication. However, the fact that a disease is obstinate in its nature, should not deter the enterprising surgeon from making persevering efforts to overcome a morbid condition. As in other forms of synovitis, the stomach and alimentary canal demand early attention, and are not to be neglected during the course of treatment. Rest is necessary for the affected joint; anodynes suit one case, and stimulants another; cold applications suit the vigorous, and hot do best for the feeble, though the feelings of the patient are to be consulted and followed in the matter of applying heat or cold. Chronic arthritis in the aged rarely proves fatal, but often inflicts permanent lameness. If the inflammation and irritation subside, the thickened and stiffened condition of the ligaments, tendons, and other soft structures, is apt to remain. In some instances the articular extremities of the bones so change that the natural mechanism of the joint is seriously impaired. I have frequently seen the head of the femur flattened and distorted as if it had been fractured, and the acetabular cavity twisted and elongated as if it had been composed of a structure more yielding than bone. After such distortions a permanent lameness would continue, though inflammatory action subsided. I have seen osseous vegetations which constituted rough buttresses about the hip-joint, that seriously interfered with muscular action and extended articular movements. These outgrowths were produced while active ostitis existed, and remained through life, though inflammation in the joint may have disappeared years before.

In gouty arthritis there is a tendency in the joints to accumulate chalk-stones, or acicular crystals of urate of soda. These concretions are usually found in the smaller articulations of the hands and feet, but may be elaborated in the larger joints. They form protuberances which, after distorting and crippling the articulation, press upon the skin as if seeking escape. Dr. Watson relates the case of a gouty gentleman who was in the habit, when at cards, of scoring the game on the table with his chalky knuckles.

The gouty deposit, which is at first liquid, becomes harder in time from the absorption of its fluid parts, and accumulates in many cases to such an extent as to render the joint completely fixed, whilst the neighboring structures are also inconvenienced by the distension to which they are subjected. Not unfrequently the integuments about a gouty joint ulcerate, and fistulous openings drain the articulation of a liquid chemically demonstrated as containing urate of soda. These sinuses seem to play the part of safety-valves, their closure being followed by fresh attacks of gout.

The treatment of arthritis depending upon urate of soda deposits in the joints must in the main be constitutional, for the cause is not local but systemic. The stomach must be prevented from forming uric acid, and agents should be administered which lessen the amount of acid already existing in the blood. Colchicum, as already mentioned in another place, helps to eliminate uric acid from the system, and to lessen the irritating nature of the chalky concretions in the joints, but attention must be directed to diet, and the administration of peptics, in order to secure substantial relief.

Gonorrhœal synovitis is not very common, but is really a distinct form of disease. It may be regarded as a metastatic affection occasionally attending or following gonorrhœa, not especially different from gonorrhœal orchitis. In those cases coming under my observation, synovitis of the knee came on during the energetic treatment of gonorrhœa, too astringent injections being employed that the urethral discharge might be arrested at once. The patients were taken with a chill soon after the use of a strong zinc-wash, and before the paroxysm was over the thigh and knee began to ache; and within forty-eight hours acute synovitis was established. The knee-joint appeared to be sympathetically affected in some mysterious way which was only traceable to the sudden subsidence of a copious urethral discharge. I have never known a woman to suffer from gonorrhœal synovitis; yet the female may have gonorrhœal rheumatism, or muscular pains, with some general fever, that might be ascribed to the genital disease or its treatment.

Occasionally a patient having gonorrhœal synovitis will demand that the urethral discharge be brought back in order that the joint might be relieved; and his medical attendant may, to cater to the whims of his patron, employ irritating bougies for that purpose. It is perhaps needless to say that a gonorrhœal synovitis can not be cured in that fanciful way, but must be treated like any other case of acute inflammation of the synovial membrane.

"LOOSE CARTILAGES" IN JOINTS.

The knee-joint, more frequently than other articulations, is liable to have developed in it one or more movable bodies of cartilaginous consistence, which, although quite free in the articulation, are attached to the walls of the joint by narrow pedicles; and when they get between the articular surfaces, may act like a nail in a hinge, abruptly arresting motion, and causing the most excruciating pain. These bodies pop about so quickly from one part of a joint to another that they have received the vulgar name of "joint-mouse." They do very little mischief unless caught between the articular surfaces, as just described.

"Loose cartilages" vary in size, from that of a barley corn to the magnitude of a small patella. Those the size and shape of an almond kernel, are the most troublesome. In rare instances these bodies lose their connection with any tissue in the joint, yet by absorption are able to maintain an independent existence, darting about from one pocket to another in the articulation. From the fact that these loose bodies are sometimes osseous, it has been supposed that they were originally pieces of bone broken from the ends of the bones entering the articulation. It has also been presumed that these strange products were nothing more than solidified precipitates from the synovia.

The treatment alone which can be relied upon is radical; and consists in removing these bodies from the joint through an incision made for that purpose. It may be of service, as a palliative measure, to wear an elastic knee-cap, but this will not prevent occasional trouble; and when the loose body slips between the articular surfaces of the bones constituting the joint, the patient falls, and is unable to rise or move until the agonizing pain subsides, and then the accident may recur again at any instant. Therefore, to escape the impending evil, removal of the cause is the only hope. But, before cutting for the body the patient must be able with his fingers to fix it in some accessible part of the joint. The outer and lower part of the joint is the best place to arrest the loose cartilage, as there the coverings are thinnest. It is well to grasp the moving body with vulsellum forceps, the long teeth going through the soft structures, or doubling them in behind the loose cartilage so it can not escape the grip while being cut upon. When once reached, it is to be seized with toothed forceps and removed, the fingers of the operator closing the wound and pressing upon the parts to prevent blood from entering the joint. The knee is then to be bandaged; and the patient put under the influence of chloral. The danger is from shock, and tetanus. No risks in the way of exercise are to be taken for several days; and local irritation is to be kept down by the topical use of anodynes and evaporating lotions.

Another method for extracting a loose cartilage from the joint is to make an incision in the synovial bag with a tenotome, and then force or drag the loose body through the opening and into the soft tissues between the synovial membrane and the integument. It is to rest in that place until the synovial capsule has healed, and then it may be safely removed through an incision made in the skin.

According to M. Larry, who refers to 167 published cases of removal of loose cartilages by operation, out of 121 cases in which the old or direct method was employed, 98 were successful, 5 doubtful, and 28 died; whilst of 39 indirect operations, 19 were successful, 15 failed, and 5 died. From this it would appear, as M. Larry states, that extraction by either method is attended with decided danger. I have removed false or moving cartilages from the knee-joint, and always by the direct method (fixing the body, then cutting upon and removing it at once), and never had worse symptoms to deal with than a severe "chill," and threatened tetanus. I think the dangers of the operation come chiefly from the presence of blood in the synovial cavity. In the event of tetanus the life of the patient would not be safe without amputation.

Inflammation of the articular extremities of bones would not differ from ordinary ostitis were it not that the synovial and other joint-structures are implicated in the morbid action, and the pus and other fluids attendant upon the disorder mingle with the synovia, and provoke pain by over-distension of the ligaments. The ostitis results in abscess, caries, and necrosis, and in its progress is attended with a distressing chain of symptoms. Purulent and other fluids find exit through sinuses which form for the purposes of drainage. Probes can be carried through these canals, and dead or uncovered bone can be felt, but such a state does not necessarily call for excision or amputation, for the natural processes are frequently competent to open outlets for the waste fluids and the disintegrated particles of osseous matter. When sinuses are slow in forming, and the distress from over-distention is great, incisions may be made to facilitate the opening process; and not unfrequently it is judicious to cut down and remove a sequestrum of dead bone which is too large to escape through a sinus.

In the management of ulcerative diseases of the joints, *rest* is an important factor. Some advantage may be gained by the injection of weak solutions of carbolic acid, yet repose in an easy attitude is worth more than medication. Bony ankylosis is generally to be desired, for then the tissues involved in the morbid processes lose their articular or specific character, and heal under immobility.

Simple synovitis may be followed by what is called "false ankylosis," or a stiffness of the joint that depends not upon disorganization of the osseous structures, but upon adventitious bands or fibrous products arising from adhesive inflammation. That kind of ankylosis can be under force broken up, and perhaps prevented, by passive motion, from returning, but true or bony ankylosis is not generally to be meddled with. The distinction between true and false ankylosis is easily determined by the fact that in osseous consolidation there is no motion in the joint, but in false ankylosis some motion is retained. Articular rigidity in false ankylosis comes in part from muscular contraction, and in part from indurated tissue about the joint. False ankylosis can frequently be overcome while the patient is under anæsthesia, the adventitious adhesions breaking under the application of great force, yet frequently the knife must first be employed to divide tendons and unyielding bands outside the articulation.

In bony ankylosis of the knee, with the leg in extreme flexion, a better attitude can be obtained by sawing a wedge shaped piece from the front aspect of the femur, and treating the limb as if it had suffered a compound fracture. This plan was devised by Dr. Barton, and has been frequently executed by other surgeons.

Men who have been exposed to syphilitic taints, are liable to neuralgic pains in and about the joints; and on account of such exposure and the absence of any other cause, they are presumed to suffer from venereal synovitis or syphilitic arthritis. Such cases usually recover through the influence of large doses of iodide of potassium and stimulating liniments. And the fact that such agents afford relief leads to the belief that the disease is a syphilitic manifestation.

Young women of a nervous or hysterical habit have been known to complain of articular neuralgia and varying forms of synovitis. The knee, for instance, may become so sensitive that a person walking across the floor may, from the jar, almost throw the patient into a convulsion. In some instances the limb wastes from inaction, though no marked or distinct form of disease exists. Such patients should be subjected to the influence of assafœtida, and sustained with iron, phosphorus, and bitter tonics; and in the course of time the joint should be exercised while the patient is under the influence of partial anæsthesia. Change of scenery, sea bathing, and encouragement, complete the cure.

MORBUS COXARIUS.

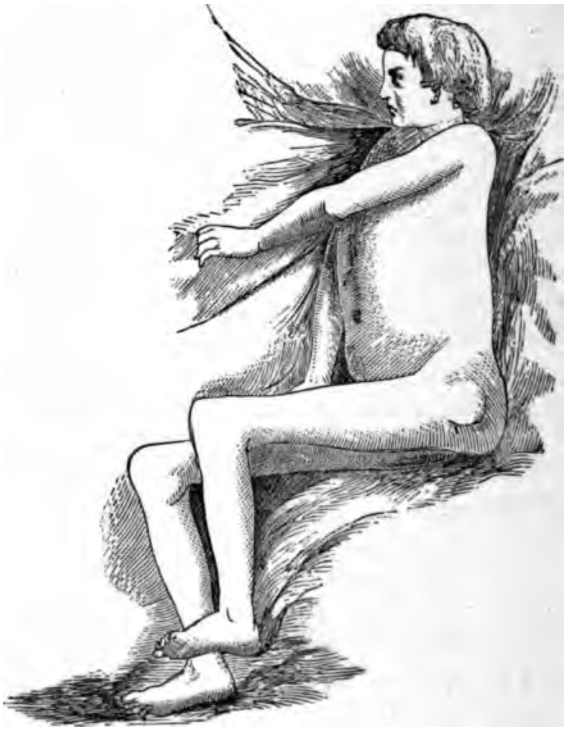
After what has been said in regard to inflammation and disease of the joints in general, no joint in particular demands separate consideration, except the coxo-femoral articulation. The hip-joint is exceedingly liable to acute disease in childhood; and the morbid action assumes so grave a nature that the phases of the disease and the treatment for each should receive special attention.

Morbus coxarius, as hip-disease is frequently called, has been supposed to arise from the devitalizing tendencies of scrofula, struma, or tuberculosis, but the teachings of Dr. Lewis A. Sayre, of New York, have led the profession to give heed to his opinions. He declares that hip-disease is rarely of scrofulous origin, but almost always proceeds from some species of violence—from a concussion, wrench, or strain, or from excessive exercise and violent changes of temperature. In some cases the ligamentum teres may suffer laceration, or the capsular ligament be overstretched.

The first stage, which is that of irritation, may begin without anything wrong being noticed, or its manifestations may be confined to slight stiffness of the joint, and an occasional lameness. If pain be complained of, it is at the knee, so that a parent is more disposed to ascribe any difficulty to that joint, instead of the hip; but the physician who has had experience with such matters, suspects the real nature of the malady, and proceeds to an investigation of the case; he strips the child of clothing to the waist, and stands him on his feet upon a table that a critical inspection of every feature below the loins may be made. If incipient hip-disease be present the child will bear his weight upon the sound leg, and the other will be slightly flexed at the hip and knee, that attitude being one of ease and repose, as no pressure from weight and muscular traction comes upon the sensitive joint. It is to be noticed that the nates on the diseased side is slightly flattened and a little lower than it is on the sound side; and the gluteo-femoral furrow or crease is lower and less distinct than upon the opposite side. These observations having been made, the child is next laid upon his back in order to make other critical tests. It will now be observed that the knee of the unsound side is raised a little from the table, so that the hand may be slid under the popliteal space; and if the flexed knee be pressed into a straight attitude, it will be observed that the spinal column in the lumbar region will at the same time rise from the table, creating a space that will admit the open hand. It will also be noticed that the diseased thigh is restricted in all its motions, especially in abduction, inward rotation, and extreme flexion; if a slight blow be imparted to the sole of the foot, or to the knee when the leg is flexed, as if to drive the limb upwards, some pain is inflicted, while moderate extension of the limb is attended with a sense of relief.

The next or second stage of the disease is reached in a few weeks, if the morbid tendency be not arrested; and its state is characterized by distension of the capsular ligament from increased synovial effusions and the accumulation of inflammatory exudations; and the effect of the pressure the effusion causes, is to flex the limb more than it was, and to abduct it as well as to rotate it outwards. The adductor muscles of the thigh, together with those whose tendons pass through the ham, become rigid, as if under partial spasm. Motion, even of a jarring nature, under these circumstances, is attended with distressing pain. The child dreads to be touched, and remains for hours in one attitude; and when a change of position is necessitated, he begins to cry in advance, for he knows full well that the most gentle movements of the body provoke agonizing distress in the limb and diseased joint.

FIG. 84.



Attitude and appearance of the limb in advanced stage of hip-disease.

If the morbid action be not overcome at this stage, it rapidly attains the third stage, as it is called, which is characterized by ulceration in the joint, suppuration, and rupture or perforation of the capsular ligament, the purulent contents escaping into the areolar tissue about the joint, or finding their way through the integument by establishing sinuses. The capsule of the joint now obtaining relief from over-distension, allows the limb to assume another attitude, which is an exaggerated form of that which appeared in the first stage of the disease. The limb is now *adducted*, and rotated *inward*, instead of *abducted*, and everted, as it was in the second stage. However, the hip on the diseased side attains a *higher* point, instead of a *lower*, as in the first stage; and the gluteo-femoral crease is *higher* than upon the sound side. The elevation comes in part from prolonged contraction of the muscles, and from a twist that occurs in the pelvis. Rupture of the capsule of the joint is attended with marked relief from pain, but the constant and profuse discharge keeps the patient from recuperating rapidly.

Although the limb is shortened at the beginning of the third stage, or as soon as the capsule bursts, it goes on shortening for a long time. This circumstance led many surgical writers to suppose that partial luxation occurred when the sudden change in the length and attitude of the limb was observed, and that complete dislocation only took place as the muscles pulled the head of the femur upward and backward upon the dorsum ilii. The late Dr. Alden March, of Albany, N. Y., was the first to call attention to the fact that dislocation never, or almost never, occurred in hip-disease, but that the softened acetabular border slid, as it were, upward, the osseous material yielding to the force of muscular traction. The upper portion of the head of the femur also yields to ulcerative action and contractile forces, so that there is a double cause for shortening and inversion of the limb. When the bottom of the acetabulum is perforated, shortening and inversion, from obvious reasons, are not so apparent.

The treatment of hip-disease varies with the stages which have been indicated. In the first stage there is simply acute synovitis, and the management of it is not to differ essentially from that laid down for synovitis in other joints, as rest, cold, and anodynes. If any thing additional is required, it is merely extension, which may be easily applied as follows: Adhesive strips are applied on each side of the leg, and they may extend above the knee. To a loop left in the plaster at the bottom of the foot a cord is attached, which is fastened to the foot of the bed. The patient is to rest on a mattress, and have good pillows. Extension is made by elevating the foot of the bed ten or twelve inches by putting blocks under the foot-posts. With this contrivance the patient's

body tends to slide towards the head of the bed, and exte
thus produced. The patient does not object to the restrai
cially as he is easy while the extension is kept up; and
have pictures and play-things to divert the mind. His
ions can visit him, and there is no complicated apparatu
disarranged. This treatment is to be followed for weeks,
months, and in many instances will result in a cure—the
stage of the disease not being reached. But in those
tractable cases that fail to substantially improve, and rat
worse, ushering in the second and distressing stage, the
must be employed to lessen the distending pressure upon
sular ligament. As the operation is attended with cons
pain, the patient may be put into an anæsthetic state w
needle is being used. In a subject worn thin with dise
distance to be penetrated is not great. The needle sh
entered a little in front of the middle of the trochante
and carried steadily towards the joint, the capsular ligame
pierced above the anterior inter-trochanteric line; and
capsule is distended with fluid, there is not much dange
ting the head or neck of the femur. The entrance havi
made and the fluid aspirated, the patient is allowed to
from the anæsthetic; and in most cases will complain o
little smarting from the puncture, and will express a
relief from the evacuation of the joint. The operation
repeated every few days, or as often as distress from re-
lation urgently calls for relief.

When confinement to the bed seems to prove detrim
the patient, he should be put in a woven-wire cuirass, o
breeches," as the apparatus is sometimes called, and take
in an easy carriage. If this machine be properly made,
applied, it is an excellent apparatus for the treatment of
in the advanced stages of morbus coxarius.

A rather ingenious though costly apparatus is now e
to treat patients who have arrived at the third stage of
ease. Its chief feature consists in its imparting extens
counter-extension, and allowing the patient to walk about
is worn. A laced shoe attached to the foot-piece is th
fastening to the limb, and a perineal band connected
upper extremity of the apparatus, above the hip, is t
fastening; and sliding bars, with a ratchet, constitute th
of applying the extending and counter-extending forces

lor's apparatus, which is now extensively used, is made after this plan.

In bad cases, where the disease reaches a point at which a cure is impossible without a removal of necrosed bone, excision of the upper extremity of the femur becomes a necessity. The operation is described under the head of "Excision of the Joints."

EXCISION OF BONES AND JOINTS.

In the management of diseases of the bones, and especially of those osseous structures that enter into the formation of joints, it is sometimes necessary, in order to save life and establish a cure, that the whole or part of a bone be removed, or excised, as the process is called.

It is to be regretted that no definite rules can be laid down for the treatment of joint diseases, but individual cases differ so widely that a certain plan of treatment which is applicable to one, might be injurious and even fatal in another. Furthermore, a certain kind of treatment is proper at one stage of joint disease that would be decidedly inapplicable at another stage.

In many instances of joint disease, the unaided recuperative forces of the body, if patiently waited upon, will bring about a cure which in its results is emphatically preferable to such as are usually obtained by operative interference. I have known a carious carpal bone to disintegrate and escape through sinuous tracts without impairing the functions of passing tendons; yet an operative procedure for the rapid removal of the same bone, would be followed by some loss of function.

One of the leading difficulties in excising parts of bones, is to determine how far the disease extends. Besides, it is found by experience that if the dead portion of a metatarsal bone, for instance, be excised, the disease will not necessarily be arrested, but may progressively invade the part which is left, and adjacent bones. It is possible that the periosteum is morbidly impressed to a distance from the seat of manifest disease, and the taint too subtle to be observed, consequently it is often proper to remove an entire bone, when its function is not important, rather than risk a return of the morbid manifestation in parts left; and it may be best, when from various indications the disordered action is extensive—impressing an entire hand or foot—to amputate at once, thus avoiding prolonged suffering and a doubtful issue.

However, it is generally well to wait, or to try more conservative means before resorting to so mutilating an operation as amputation. The surgeon of limited experience too often resorts to a measure which is likely to redound to his reputation, instead of trying means that are less pronounced in their results; but such a course is at the expense of the patient's well-being, though the unsurgical proceeding may escape detection.

As a general rule, excision is not to be performed unless a joint has suppurated or become disorganized; and amputation is only to be thought of when all rational means of a less radical nature have been tried, or when it is plain that the disease must be removed in order to save life.

In the upper extremity, any excision which affords a prospect of preserving to the patient the motion of the elbow, of the hand, of the thumb, or even of a finger, is preferable to amputation, although the patient may not recover useful motion in the joint operated on, whether it be the shoulder, the elbow, or the wrist. However, a limb which hangs useless, like a flail, may prove more of an annoyance than an advantage. In injuries and diseases of the knee-joint, excision with a prospect of anchylosis, is seemingly preferable to amputation, especially if the operative procedure be confined to the removal of thin slices of the articular extremities of the femur and tibia; and the danger attending the operation is not appreciably in excess of that of amputation. However, enough cases of excision have not yet been performed to settle the point. It is possible that many unfavorable cases of excision have not been reported. Excision of the large joints is rarely performed, except in hospitals and the civil practice of large cities. The favorable results that have followed excision of the hip-joint for the cure of the advanced stage of *morbus coxarius*, have tended to strengthen the opinion that the operation is less dangerous than amputation at the coxo-femoral articulation, in gun-shot wounds and other severe injuries of that great joint.

Excision of the ankle joint has been performed successfully in a few instances, but not enough times to establish anything very definite in regard to the merits of the operation as compared with those of amputation. Thus far surgeons prefer the latter operation. The os calcis, when much diseased or extensively injured, can be successfully removed, therefore excision of that bone is preferable to amputation. The astragalus has been removed in compound dislocation of the ankle-joint, and no serious inconvenience arises from the loss; but its removal on account of caries or necrosis has not been attempted. The front range of tarsal bones is all enveloped in the same synovial membrane, therefore they are prone to participate in each other's diseases. However, an attempt should be made to escape amputation by excising the bones affected, and repeating the operation if necessary. When one or two metatarsal bones are extensively diseased, they should be dissected out, the toes articulating with them being removed at the same time. If only the upper extremity of a metatarsal bone be excised, the corresponding toe may be left untouched. It is generally best to leave the great toe, should it become necessary to excise the first metatarsal bone.

When excision is peformed upon the large joints, the patient should be in a robust state of health, and not run down with prolonged suffering and exhaustive suppuration. Patients past the middle of life do not bear excision well; while the young recover with wonderful facility. It does little good to excise either the shafts or articular extremities of bones with the expectation of getting rid of osteo-sarcoma or other forms of malignant disease.

In the removal of long bones by excision there is a prospect of a reproduction of the osseous structure when the periosteum can be saved, but the limb undergoing excision should receive close attention after the operation, and be kept in a state of repose, as well as in an appropriate position. From what has been said, it will be understood that it requires more patience and skill to go through with a case of excision, than to execute an amputation.

EXCISION OF THE BONES OF THE HAND.

The terminal phalanx may be removed when the bone is necrosed. The condition of the bone is determined by the nature and duration of the disease, and by the use of the probe. An incision made in one side of the finger deep enough to reach the bone, will enable the operator to seize the dead phalanx with forceps, or to pry it out of place with a lever resembling an elevator. The periosteum is generally destroyed by the inflammatory and suppurative action, yet it is well to conduct the process of removal as if that membrane were still present. Although the pulp of the finger is left unsupported, it may be better than a stump after amputation. It is best not to excise the middle phalanx, nor the one next the metacarpus, for the unsupported finger is worse than useless.

Either of the metacarpal bones of the fingers may be excised by a dorsal incision and the use of a chisel and elevator, but the corresponding finger should also be removed to avoid the annoyance of an unsupported digit. However, the thumb forms an exception to the rule. When excision of its metacarpal bone becomes a necessity, the thumb, if not extensively diseased, may be preserved. Although not very useful in an unsupported state, it may be better than no thumb. If great care be exercised in the removal of the bone, an instrument like an elevator being used to disengage the periosteum, the reproduction of osseous material may restore the usefulness of the thumb.

Excision of the carpal bones, when comminuted or necrosed, is not a satisfactory operation on account of the matting together of the tendons and their sheaths. However, the wound or the sinuses attending the injury or the disease, may leave the surgeon room to execute excision without inflicting much additional harm.

Excision of the wrist-joint is not an easy operation to execute, especially if the passing tendons and their sheaths be preserved uninjured. An incision three inches long made on each side of the joint, reaching across the articulation, affords room to expose the diseased bones, which may consist of the articular extremities of the radius and ulna, and the proximal carpal bones. Perhaps the radius and ulna alone are diseased; but if the carpal row is involved, the diseased bones are to be pried out with a chisel; thus room is gained to twist the hand laterally and expose the lower extremity of the radius or ulna, as the direction given the hand may indicate. The ends of the radius and ulna are to be sawn off, each upon its own side, when exposed sufficiently for that purpose. Great care must be exercised in performing every part of the operation, or no advantage will be gained over trusting the disease to the efforts of nature. In unfavorable cases for excision, it is best to amputate when there is no hope of recovery through the natural processes.

The radius or the ulna may be excised, or a part of either of these bones. In performing the operation care should be used to preserve the periosteum in order that osseous matter which shall take the place of the original bone, may be reproduced. I have successfully removed the entire ulna, except two inches and a half of the upper extremity, and, having saved the periosteum, a new bone was reproduced. Though rough and twisted, the reproduced structure was highly useful in preserving the functions of the arm. An incision was made from the styloid process of the bone to a point just below the elbow along the outside of the arm where the bone is nearest the skin; and the line of incision was through several sinuses that discharged purulency. An elevator, curved a little at the point, was used to cleave the periosteum from the bone where it was not already loosened by disease. After arriving at a point where the bone was sound, Hey's saw was used to make a section of two-thirds the diameter of the shaft; gouge-forceps used just below the saw-cut, weakened the structure so the remainder was easily broken; and bone-nippers cut away a splinter. The shaft was then easily removed, a few touches of the knife being needed to free the lower extremity. The arm was then dressed with a couple of carved splints, and daily attention was given the wound for two months, when a continuous shaft of new bone had formed, and the limb was free from disease. If the necrosis had reached to the tip of the olecranon the entire bone might have been removed by extending the incision to that point, and by disengaging the attachment of the triceps, also the brachialis anticus and the ligamentous connections.

The upper or the lower extremity of the radius may be excised in the same way, or even the entire bone, though the hand would not be very useful unless a new bone was formed.

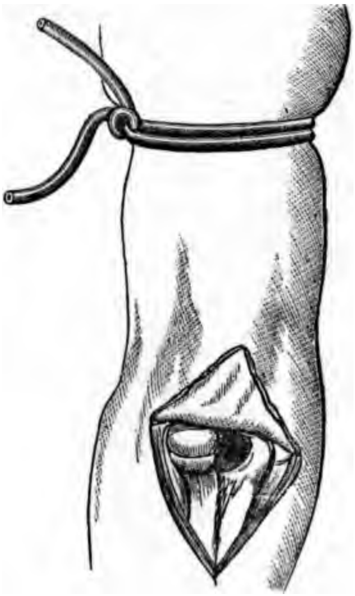
EXCISION OF THE ELBOW-JOINT.

To excise the articular structures of the elbow, operative proceedings must be executed upon the posterior aspect of the joint. An incision three inches long is to be made along the external condyloid ridge, and another along the internal ridge, both being carried a little behind the ridges and an inch below the joint; then a cross incision is to be made from one lateral incision to the other at their middle, converting the wounds into the shape of the letter H, care being taken that the ulnar nerve escape division. If the head of the radius be found dislocated upon the outer condyle, which is not an uncommon circumstance after prolonged disease of the joint, it may be sawn of, or removed with bone-nippers. An elevator or raspatory is now used to free the bones, the periosteum being first cleaved from the olecranon, then from the two condyles, care being exercised in freeing the internal condyle lest the ulnar nerve receive some damage. The cleaving instrument must be kept close to the bones; and if the process be well executed the nerve is not seen. By flexing the arm the olecranon is fully exposed, and may be removed with a saw without difficulty. The lower extremity of the humerus is then still further cleaved, and made to project from the wound, so that it may easily be removed with the saw. No arteries of any magnitude are severed, therefore little hemorrhage occurs. However, if articular branches persist in bleeding, ligatures may be applied. It is not necessary to employ a tourniquet, though an assistant is to compress the brachial in the event of unexpected hemorrhage during the operation; or, an Esmarch bandage may be employed. The radius and ulna should be excised on the same level in order to secure a good result. The humerus is to be cut across above the olecranon fossa; and there should be no stint in excising the radius and ulna. The best results have followed a free excision of all the bones entering the joint.

After the bones have been removed, and the wound made ready for closure, the edges of the divided integument are to be accurately adjusted by the application of silver sutures. A light bandage is next applied from the wrist to near the shoulder, and the limb is laid in an angular carved splint, or in a woven wire trough, which is really the best apparatus to be used. The arm is to be kept at rest for eight or ten days, or until the height of the inflammatory action has subsided, after which slight motion is allowable. At the expiration of three weeks, passive motion, that is, flexion and extension, should be practiced daily, and, later, several times a day. Thus, in some instances, a useful false-joint may be obtained. If much of the bones has been taken away, ankylosis may be prevented, but if only the tip-ends are excised, consolidation can not so certainly be obviated, therefore the most useful attitude for the limb to take, which is that of partial flexion, should be maintained. When motion is secured, the ends of the bones become united with ligamentous structure; and parts moving upon one another become rounded, polished, and covered with cartilage—in every respect resembling a false-joint, which it really is.

When the condyles are apparently sound, but the articular ırfaces diseased, a flap of integument and subcutaneous tissue ıay be turned up from the posterior aspect of the forearm, so as expose the joint-structures sufficiently for operative purposes. fter the diseased parts have been thus rendered approachable to use of Hey's saw, chain-saw, gouge-forceps, osteotrites, etc., carious material may be removed as each case may demand, by such of the instruments named as may be most available. e object of this modified re- tion is to save the condyles the support of the muscles re attached. Through a wound the size represented in the ompanying diagram the head the radius, the olecranon pro- s of the ulna, and the articu- surfaces of the lower ex- mity of the humerus may be noved; and even a considera- portion of the condyles can gouged out through this tri- gular wound in the soft tissues. he ulnar nerve must be left disturbed, and as little injury practicable inflicted upon other ructures.

FIG. 85.



Posterior aspect of the elbow exhibited; rope of rubber tubing constricts the arm; and the articular structures of the elbow are exposed by the elevation of a triangular flap.

This form of re-sected elbow to be dressed on an angular lint, and care taken to have as eful a limb as possible. Before erating the elastic bandage of smarch is to be placed on the arm; and then hæmostasis may maintained with a rope of rubber tubing while the operation going on. This precautionary measure saves considerable lood, and keeps the wound dryer during the operative procedure.

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Bryant, in his *Practice of Surgery*, says: "In all cases of disease of the elbow-joint in which natural processes are incompetent to effect a cure, excision should be performed; amputation being had recourse to only when excision is inapplicable, or has failed. In cases of compound dislocation, or fracture into the joint, excision is an excellent operation, and in gun-shot wounds the same observations apply. Amputation of the arm for injured elbow ought to be performed in quite exceptional cases." Bryant advises that the operation be performed through a vertical incision over the olecranon process, the cut extending three inches above and two inches below the joint, the incision dividing all the tissues down to the bones; the soft parts should then be carefully separated from the bones and drawn aside, the ulnar nerve being raised from the inner condyle, with the inner half of the triceps tendon and fascia. "*No transverse incision across the triceps tendon should be made.*" Notwithstanding this high authority, it will be found a difficult matter in most instances to drag the tissues laterally when only a vertical incision is made, to an extent that will allow the bones to protrude, though his long incision—five inches—favors the protrusion. Besides, the use of the triceps for extending purposes, which he claims is not appreciable when it is considered that three inches, more or less, of the bones of the limb are removed, is still valuable. If the H shaped wound be made, the lower flap between the lateral incisions should be shortened by cutting away a piece of the integument and fascia, in order that the attachment of the triceps may be lower than it was, to compensate in part for the shortening the bones have undergone.

EXCISION OF THE SHOULDER-JOINT.

Excision of the scapular extremity of the humerus is to be performed in bad cases of comminuted fractures, complicated with wounds extending into the scapulo-humeral articulation, as in gun-shot wounds, also, for necrosis, and some incurable affections of the joint. The ultimate results of excision of the shoulder-joint, whether for injury or disease, have been very satisfactory. In many instances every motion is preserved to the arm, except that of raising it above the head.

The operation is performed by making an incision from the acromion down upon the arm four or five inches; and it should be parallel with the bicipital groove of the humerus in order to free the tendon that lies in it. The scalpel is then employed to divide the tendonous connections of the tuberosities, and the capsular ligament, if these structures have not already yielded to ulcerative disease. The tendon of the long head of the biceps is to be spared, yet it should be displaced from the bicipital groove, and pushed inwards. The arm is now grasped near the elbow, and by being used as a lever the head of the humerus is forced out of the wound. A piece of pasteboard is to be inserted between the soft tissues and the bone, and a saw removes as much of the humerus as is diseased. The glenoid cavity is then to be examined, as well as the acromial and coracoid processes; and if found diseased the gouge-forceps are to be used in the further process of excision. The humerus is then to be replaced, and the soft structures adjusted over it. The edges of the wound may be drawn together with sutures and adhesive strips; and a compress may be held upon the wound by two or three narrow strips of plaster. The lower part of the wound is to be left open to facilitate the escape of fluids. The arm should be supported in a sling, or held to the chest by long pieces of adhesive plaster, as in the dressing for fracture of the clavicle. Aconite, veratrum, and anodynes may be administered to hold high grades of inflammation in check, and to overcome violent pain. The healing process may occupy six or eight weeks, and even more time. As a general thing motion is retained, and the functions of the arm are not much impaired. If ankylosis occurs, the rather free movements of

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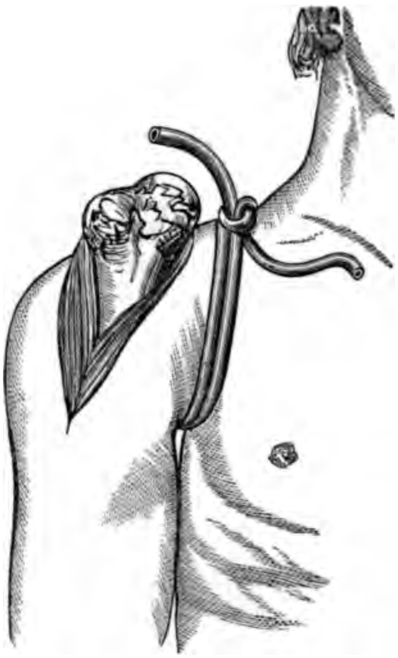

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The danger from excision is not as great as that attending amputation; and when the utility of the limb is considered, the thought of amputation should not be entertained as long as excision is practicable. Bleeding from the posterior circumflex artery is not likely to be troublesome when the single straight incision is employed; but when a flap is made of the deltoid muscle by an oval incision, that vessel may need ligating. To escape all danger from hemorrhage the arm may be rendered bloodless by the use of Esmarch's bandage. The rope of rubber-tubing employed to constrict the shoulder and axilla should be large and strong. Two turns and a knot will hold the blood back.

EXCISION OF THE CLAVICLE.

The clavicle is subject to ulcerative diseases, yet rarely becomes wholly necrosed. The bone being almost subcutaneous the difficulty in wholly removing it is not great. However, its external end is held in place by a complicated mass of muscular and ligamentous tissues. When the bone is diseased throughout its entire extent, and there is no hope of saving any part of it, excision is to be practiced by making an incision along its upper or anterior face, when a raspatory may be employed to cleave the periosteum from the bone as far as practicable. The knife and chisel are necessary to free and disengage the outer extremity from the acromion and coracoid processes. After the end of the bone is released from its connections, it is lifted up and still further cleaved by the raspatory, until its inner extremity is reached, when disengagement from the sternum may be effected by the use of a knife or chisel. An important feature of the operation is to keep close to the bone while using any of the instruments, in order to escape injuring important structures beneath.

When a part of the clavicle needs excising, which is oftener the case than the entire bone requires removal, the diseased structure is exposed by an incision along its front aspect; Hey's saw may be used to divide the bone. A chain-saw can be employed, yet care must be exercised while carrying the free end under the bone. But before removal of the segment, the raspatory is employed to clear the bone of its periosteal covering. In many cases this is not so difficult as might be supposed, for suppurative action has already loosened the membranous envelop.

Syphilitic nodes are common on the clavicle, but they almost never need excising; they may continue as osseous deposits under the periosteum, or become disintegrated by ulcerative action. Occasionally a layer of new bone will form around parts of a necrosed clavicle and the dead portion may come away as a sequestrum, or be removed as such.

Excision of the scapula for a necrosed state of the bone, is a legitimate operation when every indication is favorable. The positions of the sinuses generally indicate where the incisions should be made. An incision along the spine of the bone, with shorter cross incisions, affords room to clean the dorsal surfaces of the blade, and even a chance to free its borders of muscular attachments. If the supra-scapular artery be divided, it may be ligated, after which not much hemorrhage need be expected. The under side of the blade, as soon as it can be reached in the course of the operation, is to be cleaved with a raspatory or chisel ; and the disarticulation, from the clavicle and humerus, should be conducted with care, to avoid injuring the axillary structures. The arm, after excision of the entire scapula, is not very useful. If only a part of the scapula needs removing, the functions of the arm may, in a great measure, be preserved.

EXCISION OF PARTS OF THE FOOT.

The phalangeal bones of the toes should not be excised, except the terminal bone of the great toe. The pulp of this toe being useful in standing and walking, should not be amputated to get rid of necrosis, yet the other toes may be sacrificed without impairing locomotion. The metatarsal bones of the four lesser toes may be excised without serious detriment to the functions of the foot, but the corresponding toes should be removed at the same time; yet when it is necessary to excise the metatarsal bone of the great toe, the rule does not apply. To excise a metatarsal bone, an incision should be made along its upper aspect and for its entire length. A chisel is then used to clean the bone, and to disarticulate it at its upper extremity; the lower end is freed by amputating the toe, and prying the bone from its lodgment

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between adjacent metatarsal bones. The operation is a little tedious on account of articular connections, yet the use of a chisel and elevator enables the efficient operator to disarticulate and dislodge the bone quite readily. After one metatarsal bone is removed, a second may be taken away with diminished trouble. An incision is to be made for the removal of each separate bone.

The metatarsal bone of the great toe is often diseased, yet its distance from the other metatarsals, except at its extremities, seems to protect, in some measure, the rest of the metatarsal chain. The bone is to be removed by making an incision the whole length of the bone, and a short cross incision at both extremities, that rectangular flaps may be turned back to afford room for the completion of the operation. The upper extremity is then to be disarticulated, the periosteum cleaved off if possible, and the separation from the phalanx effected with great care, to avoid wounding the plantar arch; whereas if the artery be divided in the early part of the operation, while attempting to disarticulate the lower end of the bone, the bleeding may prove somewhat embarrassing. After exsection of the first metatarsal bone the great toe draws back towards the tarsus, yet the function of the foot is but little impaired.

The cuneiform bones, one or all, can be excised, when necrosed, by making a crucial incision over them, and then dislodging them with an elevator, raspatory, or chisel, the carious or necrosed osseous structure coming away piecemeal. An important care is to remove all the dead and diseased bone, articular surfaces not excepted. A perplexity attendant upon such operations is that the morbid process, baffled in one bone, inclines to attack another. I have cut upon the cuboid bone, being guided by the sinuses, and with an elevator have scraped out all the spongy structure, and left most of the shell. The patient, a girl twelve years old, made a good recovery, and lost none of the functions of the foot. The astragalus can not be excised for the cure of necrosis, without a doubtful issue; however, a part of it has been removed with the scaphoid, a raspatory being the instrument employed after the primitive incisions were made. When there is extensive disease of the tarsal bones, including the astragalus, amputation is the preferable method for its disposal.

The os calcis is a bone which may be removed with safety and success, and is one which is often diseased, the morbid action beginning between the calcaneum and the astragalus, and then spreading to the former bone. It is not uncommon that the spongy structure alone needs removal, the shell on the outside remaining sound; yet the inexperienced operator must not place too much confidence in the external wall, for it has frequently become necrosed after the softened and granular mass within has been carefully scooped out. Inasmuch as patients have made good recoveries, and been favored with a useful foot after the entire calcaneum has been removed, it is generally most satisfactory in the end, to excise the entire bone, not trusting to the filling up of a scooped out cavity which so often proves a failure. It is very easy to empty the thin shell, but the results have not always been satisfactory.

Excision of the entire calcaneum may be performed as follows: An incision is begun at the inner edge of the tendo-Achillis, and extending by a sweep around the heel to the outside of the foot, reaches a point midway between the external malleolus and the tarsal extremity of the metatarsal bone of the little toe, a point which corresponds with the calcaneo-cuboid articulation. This incision should go down to the bone; and the tendo-Achillis will be heard to snap as the knife severs its fibres. It should be as nearly as possible on a level with the upper border of the os calcis—a point which the operator can determine, if the dorsum of the foot is in a natural state, by feeling the pit in which the extensor brevis digitorum muscle arises. Another incision commencing where the other terminated, should be drawn across the sole, at a right angle with the first, and extend to the internal surface of the os calcis, beyond which point it should not reach through fear of wounding the posterior tibial vessels. The calcaneum is now to be denuded by dissecting the flap from the osseous structure, the instruments being kept close to the bone; the calcaneo-cuboid joint is then to be opened, and afterwards the articulations with the astragalus. The close connections between these two bones make it difficult to disarticulate the bones unless disease has already loosened the bands of union. The os calcis having been thus separated from its bony connections by the use of a chisel, knife, and lever, the bone can be slightly rotated while the fibrous attachments on its inner side are carefully cleaned off by keeping the cleaving instruments close to the osseous structure to avoid wounding the vessels which pass near the bone. The wound is now to be closed with wire sutures, unless the astragalus be found in a necrosed state, the pulp of the finger is left unsupported, it may be better than a stump after amputation. It is best not to excise the middle phalanx, nor the one next the metacarpus, for the unsupported finger is worse than useless.

Either of the metacarpal bones of the fingers may be excised by a dorsal incision and the use of a chisel and elevator, but the corresponding finger should also be removed to avoid the annoyance of an unsupported digit. However, the thumb forms an exception to the rule. When excision of its metacarpal bone becomes a necessity, the thumb, if not extensively diseased, may be preserved. Although not very useful in an unsupported state, it may be better than no thumb. If great care be exercised in the removal of the bone, an instrument like an elevator being used to disengage the periosteum, the reproduction of osseous material may restore the usefulness of the thumb.

Excision of the carpal bones, when comminuted or necrosed, is not a satisfactory operation on account of the matting together of the tendons and their sheaths. However, the wound or the sinuses attending the injury or the disease, may leave the surgeon room to execute excision without inflicting much additional harm.

Excision of the wrist-joint is not an easy operation to execute, especially if the passing tendons and their sheaths be preserved uninjured. An incision three inches long made on each side of the joint, reaching across the articulation, affords room to expose the diseased bones, which may consist of the articular extremities of the radius and ulna, and the proximal carpal bones. Perhaps the radius and ulna alone are diseased; but if the carpal row is involved, the diseased bones are to be pried out with a chisel; thus room is gained to twist the hand laterally and expose the lower extremity of the radius or ulna, as the direction given the hand may indicate. The ends of the radius and ulna are to be sawn off, each upon its own side, when exposed sufficiently for that purpose. Great care must be exercised in performing every part of the operation, or no advantage will be gained over trusting the disease to the efforts of nature. In unfavorable cases for excision, it is best to amputate when there is no hope of recovery through the natural processes.

The radius or the ulna may be excised, or a part of either of these bones. In performing the operation care should be used to preserve the periosteum in order that osseous matter which shall take the place of the original bone, may be reproduced. I have successfully removed the entire ulna, except two inches and a half of the upper extremity, and, having saved the periosteum, a new bone was reproduced. Though rough and twisted, the reproduced structure was highly useful in preserving the functions of the arm. An incision was made from the styloid process of the bone to a point just below the elbow along the outside of the arm where the bone is nearest the skin; and the line of incision was through several sinuses that discharged purulency. An elevator, curved a little at the point, was used to cleave the periosteum from the bone where it was not already loosened by disease. After arriving at a point where the bone was sound, Hey's saw was used to make a section of two-thirds the diameter of the shaft; gouge-forceps used just below the saw-cut, weakened the structure so the remainder was easily broken; and bone-nippers cut away a splinter. The shaft was then easily removed, a few touches of the knife being needed to free the lower extremity. The arm was then dressed with a couple of carved splints, and daily attention was given the wound for two months, when a continuous shaft of new bone had formed, and the limb was free from disease. If the necrosis had reached to the tip of the olecranon the entire bone might have been removed by extending the incision to that point, and by disengaging the attachment of the triceps, also the brachialis anticus and the ligamentous connections.

The upper or the lower extremity of the radius may be excised in the same way, or even the entire bone, though the hand would not be very useful unless a new bone was formed.

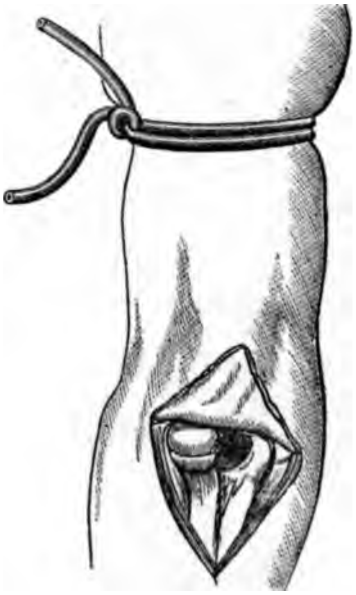
EXCISION OF THE ELBOW-JOINT.

To excise the articular structures of the elbow, operative proceedings must be executed upon the posterior aspect of the joint. An incision three inches long is to be made along the external condyloid ridge, and another along the internal ridge, both being carried a little behind the ridges and an inch below the joint; then a cross incision is to be made from one lateral incision to the other at their middle, converting the wounds into the shape of the letter H, care being taken that the ulnar nerve escape division. If the head of the radius be found dislocated upon the outer condyle, which is not an uncommon circumstance after prolonged disease of the joint, it may be sawn of, or removed with bone-nippers. An elevator or raspatory is now used to free the bones, the periosteum being first cleaved from the olecranon, then from the two condyles, care being exercised in freeing the internal condyle lest the ulnar nerve receive some damage. The cleaving instrument must be kept close to the bones; and if the process be well executed the nerve is not seen. By flexing the arm the olecranon is fully exposed, and may be removed with a saw without difficulty. The lower extremity of the humerus is then still further cleaved, and made to project from the wound, so that it may easily be removed with the saw. No arteries of any magnitude are severed, therefore little hemorrhage occurs. However, if articular branches persist in bleeding, ligatures may be applied. It is not necessary to employ a tourniquet, though an assistant is to compress the brachial in the event of unexpected hemorrhage during the operation; or, an Esmarch bandage may be employed. The radius and ulna should be excised on the same level in order to secure a good result. The humerus is to be cut across above the olecranon fossa; and there should be no stint in excising the radius and ulna. The best results have followed a free excision of all the bones entering the joint.

After the bones have been removed, and the wound made ready for closure, the edges of the divided integument are to be accurately adjusted by the application of silver sutures. A light bandage is next applied from the wrist to near the shoulder, and the limb is laid in an angular carved splint, or in a woven wire trough, which is really the best apparatus to be used. The arm is to be kept at rest for eight or ten days, or until the height of the inflammatory action has subsided, after which slight motion is allowable. At the expiration of three weeks, passive motion, that is, flexion and extension, should be practiced daily, and, later, several times a day. Thus, in some instances, a useful false-joint may be obtained. If much of the bones has been taken away, ankylosis may be prevented, but if only the tip-ends are excised, consolidation can not so certainly be obviated, therefore the most useful attitude for the limb to take, which is that of partial flexion, should be maintained. When motion is secured, the ends of the bones become united with ligamentous structure; and parts moving upon one another become rounded, polished, and covered with cartilage—in every respect resembling a false-joint, which it really is.

When the condyles are apparently sound, but the articular surfaces diseased, a flap of integument and subcutaneous tissue may be turned up from the posterior aspect of the forearm, so as to expose the joint-structures sufficiently for operative purposes. After the diseased parts have been thus rendered approachable to the use of Hey's saw, chain-saw, gouge-forceps, osteotrites, etc., the carious material may be removed as each case may demand, and by such of the instruments named as may be most available. The object of this modified re-section is to save the condyles for the support of the muscles there attached. Through a wound of the size represented in the accompanying diagram the head of the radius, the olecranon process of the ulna, and the articular surfaces of the lower extremity of the humerus may be removed; and even a considerable portion of the condyles can be gouged out through this triangular wound in the soft tissues. The ulnar nerve must be left undisturbed, and as little injury as practicable inflicted upon other structures.

FIG. 85.



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This form of re-sected elbow is to be dressed on an angular splint, and care taken to have as useful a limb as possible. Before operating the elastic bandage of Esmarch is to be placed on the arm; and then hæmostasis may be maintained with a rope of rubber tubing while the operation is going on. This precautionary measure saves considerable blood, and keeps the wound dryer during the operative procedure.

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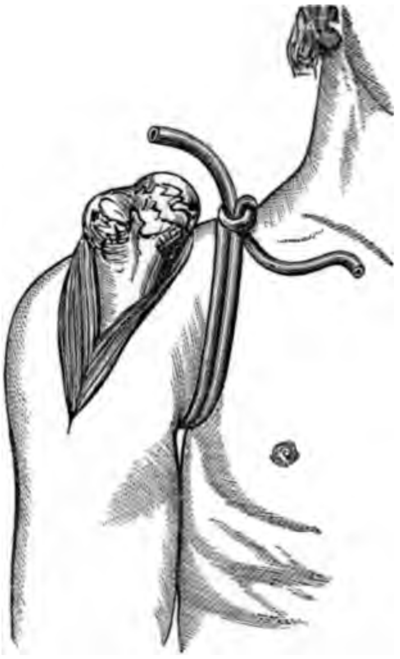

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between adjacent metatarsal bones. The operation is a little tedious on account of articular connections, yet the use of a chisel and elevator enables the efficient operator to disarticulate and dislodge the bone quite readily. After one metatarsal bone is removed, a second may be taken away with diminished trouble. An incision is to be made for the removal of each separate bone.

The metatarsal bone of the great toe is often diseased, yet its distance from the other metatarsals, except at its extremities, seems to protect, in some measure, the rest of the metatarsal chain. The bone is to be removed by making an incision the whole length of the bone, and a short cross incision at both extremities, that rectangular flaps may be turned back to afford room for the completion of the operation. The upper extremity is then to be disarticulated, the periosteum cleaved off if possible, and the separation from the phalanx effected with great care, to avoid wounding the plantar arch; whereas if the artery be divided in the early part of the operation, while attempting to disarticulate the lower end of the bone, the bleeding may prove somewhat embarrassing. After exsection of the first metatarsal bone the great toe draws back towards the tarsus, yet the function of the foot is but little impaired.

The cuneiform bones, one or all, can be excised, when necrosed, by making a crucial incision over them, and then dislodging them with an elevator, raspatory, or chisel, the carious or necrosed osseous structure coming away piecemeal. An important care is to remove all the dead and diseased bone, articular surfaces not excepted. A perplexity attendant upon such operations is that the morbid process, baffled in one bone, inclines to attack another. I have cut upon the cuboid bone, being guided by the sinuses, and with an elevator have scraped out all the spongy structure, and left most of the shell. The patient, a girl twelve years old, made a good recovery, and lost none of the functions of the foot. The astragalus can not be excised for the cure of necrosis, without a doubtful issue; however, a part of it has been removed with the scaphoid, a raspatory being the instrument employed after the primitive incisions were made. When there is extensive disease of the tarsal bones, including the astragalus, amputation is the preferable method for its disposal.

The os calcis is a bone which may be removed with safety and success, and is one which is often diseased, the morbid action beginning between the calcaneum and the astragalus, and then spreading to the former bone. It is not uncommon that the spongy structure alone needs removal, the shell on the outside remaining sound; yet the inexperienced operator must not place too much confidence in the external wall, for it has frequently become necrosed after the softened and granular mass within has been carefully scooped out. Inasmuch as patients have made good recoveries, and been favored with a useful foot after the entire calcaneum has been removed, it is generally most satisfactory in the end, to excise the entire bone, not trusting to the filling up of a scooped out cavity which so often proves a failure. It is very easy to empty the thin shell, but the results have not always been satisfactory.

Excision of the entire calcaneum may be performed as follows: An incision is begun at the inner edge of the tendo-Achillis, and extending by a sweep around the heel to the outside of the foot, reaches a point midway between the external malleolus and the tarsal extremity of the metatarsal bone of the little toe, a point which corresponds with the calcaneo-cuboid articulation. This incision should go down to the bone; and the tendo-Achillis will be heard to snap as the knife severs its fibres. It should be as nearly as possible on a level with the upper border of the os calcis—a point which the operator can determine, if the dorsum of the foot is in a natural state, by feeling the pit in which the extensor brevis digitorum muscle arises. Another incision commencing where the other terminated, should be drawn across the sole, at a right angle with the first, and extend to the internal surface of the os calcis, beyond which point it should not reach through fear of wounding the posterior tibial vessels. The calcaneum is now to be denuded by dissecting the flap from the osseous structure, the instruments being kept close to the bone; the calcaneo-cuboid joint is then to be opened, and afterwards the articulations with the astragalus. The close connections between these two bones make it difficult to disarticulate the bones unless disease has already loosened the bands of union. The os calcis having been thus separated from its bony connections by the use of a chisel, knife, and lever, the bone can be slightly rotated while the fibrous attachments on its inner side are carefully cleaned off by keeping the cleaving instruments close to the osseous structure to avoid wounding the vessels which pass near the bone. The wound is now to be closed with wire sutures, unless the astragalus be found in a necrosed state, and no hope of cure without amputation remains. In the latter event, the anterior flap may be made by extending the first incision in front of the ankle, the knife reaching a point on the inside of the foot corresponding with the termination of the transverse incision across the sōle, if that had been brought to the top of the os calcis, which it now may be in order to complete the incisions necessary to amputate at the ankle-joint. The astragalus is then disconnected from the tibia and fibula, the articular surfaces of these leg-bones are removed with a saw; and an operation which began in excision ended in a successful amputation, without much variation of the original plan.

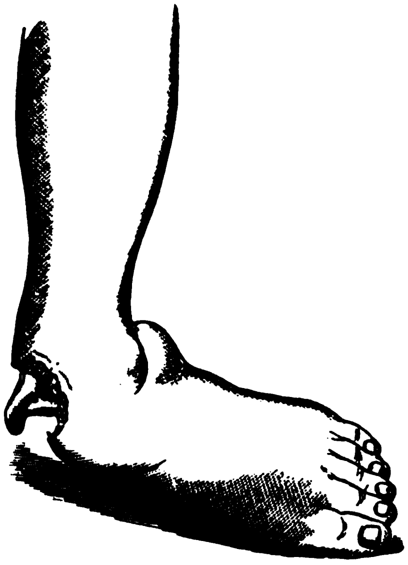
If only the os calcis be diseased the excision will leave less defect and a better foot, than might be expected from so much mutilation, experience having taught that a very serviceable foot may be preserved to the patient. No arteries need ligating, for none of any size are divided. The healing process extends through months, so great is the cavity to be filled up. When the posterior portion of the os calcis is shattered or comminuted by a bullet or crushing force, it might be necessary to excise the entire bone.

EXCISION OF THE ANKLE-JOINT.

Carious disease of the astragalus and of the lower extremity of the tibia, when confined strictly to those bones, might as legitimately call for excision, as the same morbid action in other joints; but it is rare for the disease to be so circumscribed, at least it is difficult to diagnose its extent and limitations. The os calcis is apt to be involved in the morbid processes, or some of the other tarsal bones, rendering the case too complicated for simple excision of the ankle-joint. Besides, as has been before intimated, caries of one of the tarsal bones, is liable to extend to others of the group, consequently there is no certainty in the excising process. It is better to amputate at once, the certainty and celerity of the cure far out-weighing any possible advantage claimed by the advocates of excision.

Mr. Barwell, who has had great experience in the treatment of diseases of the joints, describes the manner in which excision of the ankle-joint should be performed, in the following language: "The foot is first laid on its inside, and an incision is made over the lower three inches of the posterior edge of the fibula. When it has reached the lower end of the malleolus, it forms an angle, and runs downwards and forwards to within about half an inch of the base of the outer metatarsal bone. The angular flap is reflected forwards; the fibula, about two inches above the malleolus, is sufficiently cleared of soft parts to allow cutting forceps to be placed over it, and the bone is then nipped in two, and carefully dissected out, leaving the peroneus longus and brevis tendons uncut. The foot is now to be turned over. A similar incision is made on the inner side, the portion on the foot terminating over the projection of the inner cuneiform bone. The flap is to be turned back, and the sheaths of the flexor digitorum and posterior tibial tendons divided, the knife being kept close to the bone, avoiding the artery and nerve. The internal lateral ligament is then to be severed carefully, close to the bone; and now the foot is twisted outwards, and the astragalus and tibia will present at the inner wound. A narrow-bladed saw, put in between the tendons and the inner wound, projects through the outer. The lower end of the tibia, then the top of the astragalus, may be sawn off in a proper direction. The only vessel that may require tying, is one of the lower branches of the peroneal artery.

FIG. 87.



Compound dislocation of the ankle-joint, which might require excision.

"The wound may be closed with sutures, except that part opposite the breach of the osseous matter; and the leg and foot placed on a splint with a foot-board, and cold water applied. No shock follows the operation. The patients get well very quickly; a fact which may in part be attributed to there being no necessity for rigid confinement, as in other large joints of the lower extremity."

It is sometimes necessary, in compound dislocations of the ankle, to excise the astragalus, and the splintered internal malleolus, but this is not excision of the ankle-joint in the ordinary acceptation of the term. It is merely a removal of parts that prevent a reduction of the dislocation, or such as are liable to retard the healing process. When the astragalus is shattered by a bullet, and serious injury is inflicted upon the articular surfaces of the ankle-joint, immediate amputation is safer than excision.

EXCISION OF THE KNEE-JOINT.

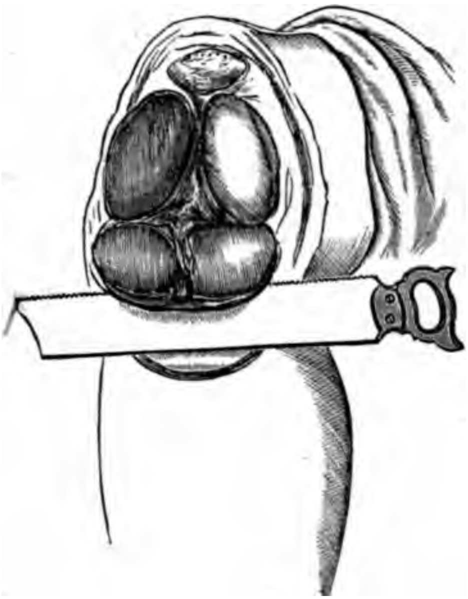
In cases of inflammatory disease of the knee-joint, there exists a hope of cure without operative interference, until suppuration sets in; and even then the natural processes may be able, with some help from art, to bring about a favorable result without a resort to excision or amputation.

"When suppuration," says Mr. Bryant, "has taken place in a knee-joint, the question of operation naturally suggests itself to the surgeon; for he asks himself whether natural processes are competent to conduct the case to a successful issue; whether the local disease is of such a nature as to be incurable, unassisted by art; whether the general powers of the patient are sufficiently good to bear up against the demands that will necessarily be made upon them in the progress of a natural cure; and last, but not least, whether it is expedient to make the attempt.

"All these questions require for their solution much thought and judgment, and a careful weighing of probabilities. The cause of the disease and the disorganizing process is also a point of primary importance. As a broad rule, when the disease is in the synovial tissue alone, and suppuration has taken place, a cure by natural processes, assisted by art, is generally to be secured, should the power of the patient be good. Pathologically there is no reason why recovery should not take place. On the other hand, as a broad rule, when the disease has originated in the bone and spread to the synovial membrane, and disorganization of the joint has taken place, a cure by natural processes, is very improbable, and the removal of the diseased part by some operation is generally demanded. Pathologically, good reasons exist why recovery should not take place, and clinically this observation is borne out."

Excision of the knee-joint has been practiced quite frequently, especially in the hospitals of Europe; and it is an operation which has been executed quite frequently in this country, particularly in the large cities. Those who have never performed the operation, or not more than once or twice and have had bad luck with their cases, quite naturally pronounce against excision, using as arguments that amputation is less dangerous to life, is attended with a quicker cure, and a good artificial leg is less objectionable than a shortened, ankylosed, and otherwise defective natural one. In excision the surfaces of bone exposed are very large, and the lesion is like a great compound fracture, conditions which call for considerable reparative power, and entail dangers from which amputation is comparatively exempt. Elderly persons do not possess the reparative power to undergo excision;

FIG. 88.



Excision of the knee-joint.

and patients who are suffering from acute inflammatory action of a violent nature, should not be subjected to the risks of so depressing an operation.

When the articular surfaces of the tibia and femur are necrosed, exhaustive suppuration exists, and the disease does not extend far beyond the joint, excision admits of consideration; and if other conditions be favorable for an operation, it may be performed without there being a question of its propriety. Articular ostitis, with necrosis, are the prominent indications for excision; and the choice between it and amputation only remains. Excision of the knee is followed by ankylosis and shortening of the limb, but ankylosis without shortening makes very awkward progression, consequently the loss in the length of the leg that follows excision is not to be considered as prejudicial to the operation; and as ankylosis generally results from suppurative arthritis, a cure by natural processes, the ankylosis which follows excision is not to be counted as wholly against the operation. Excision of the knee for gun-shot wounds has proved unsatisfactory; and in cases, whether of injury or disease, in which operative measures seem necessary to save life, amputation is the preferable operation.

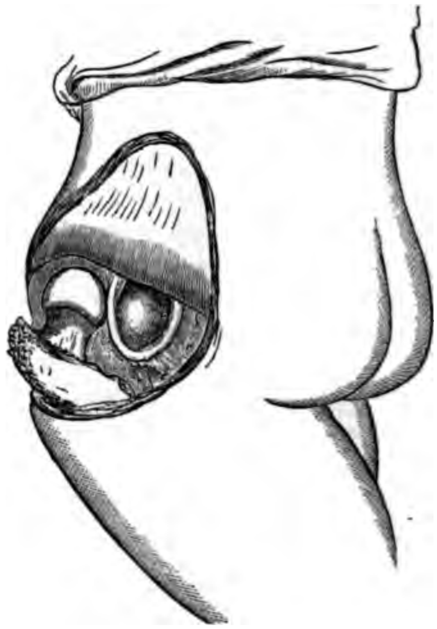
Excision is performed as follows: An incision is made from the back part of one condyle of the femur to the back part of the other, passing across the front of the limb below the patella, the knife curving downwards and then upwards in its course, and severing the ligamentum patellæ as it passes, as well as all the soft tissues in its way. The patella is then dissected away, for its continuance is useless, and its preservation may lead to unpleasant complications. The soft tissues to form the upper flap are dissected upwards, the lateral ligaments are to be cut when not divided by the first incision, the leg flexed, and the condyles of the femur forced forwards and out of the wound. A saw is then employed to lop off as much of the condyles as appear to be diseased, care being exercised in the last few strokes of the saw that the popliteal artery receives no injury. It is better to break the lower lamella of bone by a twist of the saw, than to assume any risk in so important a matter. After the end of the femur has been removed, and spicula have been cut away with bone-nippers, the head of the tibia is to be cleaned, pushed prominently into the wound, and with the saw separated close to the cartilaginous surface. The limb is now placed in a straight position, and the sawn surfaces come quite accurately against each other. If they do not come together evenly, a slice should be removed from the femur with a view of correcting the obliquity. The edges of the wound are then drawn together with sutures. The leg may be enveloped in a bandage to steady the muscles, and, in a straight attitude, placed in a carved splint. Absorbents must be placed about the wound to take up the fluids; and water should be used freely for a few days to restrain the inflammatory action. In other words, the case is to be managed like a compound fracture. If in the course of a few days or weeks, it be discovered that the necrosis is extending, amputation should be performed without further delay.

EXCISION OF THE HIP-JOINT.

The coxo-femoral articulation is exceedingly liable to ulcerative disease, the cure of which may not be possible without removing the head of the femur, and sometimes the bottom and brim of the acetabular cavity. *Morbus coxarius* is the disease which in its course often reaches an ulcerative state—a disease which formerly was presumed to depend upon a strumous habit of body. But Dr. Sayre, of New York, who has devoted a great deal of attention to hip-joint diseases, thinks otherwise; and his authority upon the subject is entitled to consideration. He affirms that morbus coxarius is always traumatic, no case occurring without some injury to the joint has been sustained within a few days, weeks, or months; and he also declares that weak and scrofulous children who have little disposition to romp and climb, are less frequently affected than the robust who incur greater risks on account of the pleasure they take in violent exercise and daring feats.

Dr. Sayre divides hip-disease into three stages: 1st, that of irritation; 2d, that of effusion; and 3d, that of ulceration, during which the capsule is ruptured through softening and over-distension, and the acetabulum is perforated. As it is only the last stage that would require excision, the treatment for the other two will be found in another place (see under head of *Morbus Coxarius*). Not all cases of sinuses leading to the joint, with evidence of ulcerative action in the bone, require excision for a cure, but when the natural processes are incompetent to cure, though aided by the best devised instruments, and death is likely to occur unless the dead bone be removed, excision becomes imperative. The operation is neither difficult nor dangerous, and the results have been exceedingly satisfactory. Dr. Sayre selects a point half way between the crest of the ilium and the trochanter major to begin the incision, and then with a deep cut he carries the knife downward and outward for a distance of three inches, striking the posterior edge of the greater trochanter, and then goes two or three inches further in a course downward but inward, the shape of the incision being crescentic, and in depth reaching to the bone all the way. No vessels of [illegible] importance are severed, yet if an arterial twig persists in ble[illegible]ing, it may be twisted or tied. The wound is to be dilated w[illegible] spatulas while a narrow scalpel or strong bistoury is made divide the periosteum three quarters of the way around the bo[illegible] at a point just above the trochanter minor. This is where t[illegible] saw is to be used in removing the head of the femur. The fi[illegible] incision is presumed to have divided the periosteum in its cou[illegible], therefore the raspatory or elevator may now be employed to cleave the periosteal flaps from the head of the bone, muscular

FIG. 89.



Coxo-femoral articulation exposed by turning up a flap.

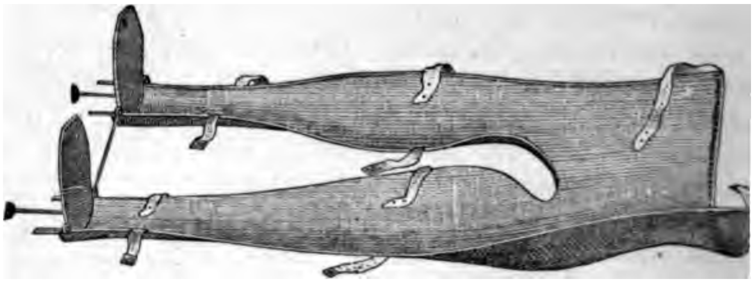
attachments going with the periosteum. Disease has loosened the covering of the bone in most instances, therefore the cleaving process is easy. If the tendons of the rotator muscles firmly adhere to the digital fossa, scissors may be used to divide them. The thigh is now to be strongly adducted and depressed, to throw the head of the bone into the wound, and the effort will be successful if the capsule be incised and the ligamentum teres divided. A chain, Hey's, or phalangeal saw is now to be used in dividing the bone—the section being just below the trochanter major. If the bone be diseased lower down, the wound may be extended, another circular incision of periosteum made, and more of the bone removed with the saw. It is never best to leave the trochanter major, though only the head and neck of the bone be diseased, for that osseous projection occludes the wound, and interferes with finishing the operation. Before closing the wound the acetabulum should be explored; and a gouge-forceps may be employed to remove carious or necrosed bone. In the event that the bottom of the acetabular cavity is perforated, the edges of the opening are to be clipped away until a sound periosteal connection is met.

In the treatment of all extensive wounds, a solution of salicylic acid should be employed to wash the traumatic and diseased surfaces. The agent prevents blood poisoning, fermentation, and fœtor. Two or three grains of salicylic acid, with as much borax, will dissolve in an ounce of hot water, and stay in solution when cold.

The edges of the wound are to be drawn together with sutures and plasters, though a space is to be left for drainage. The "wire-breeches," so called, constitute a good apparatus to place the patient in during the healing process. With this machine the legs can be kept at equal lengths, and in a proper relation to each other. A hitch is made to the leg by means of a long strip of adhesive plaster which reaches from the trochanter minor, down the inside of the thigh and leg to the foot, where an inch or two of slack is left for a loop, and then up on the outside of the limb to near the wound. The loop is to be fastened to the foot-piece of the apparatus, and a screw imparts extension, counter-extension being obtained by pressure of the machine against the tuberosities of the ischium. After a child is well secured in the apparatus, and its health will permit, it can be transferred to a carriage and thus receive an out-door airing.

The apparatus is to be lined with flannel and wadded with cotton to obviate excoriation; and a fenestrum is to be made in th outside of the upper part of the cuirass, to facilitate change o absorbents and other dressings. A perineal bandage may b used on the sound side, to ease the counter-extending force whic

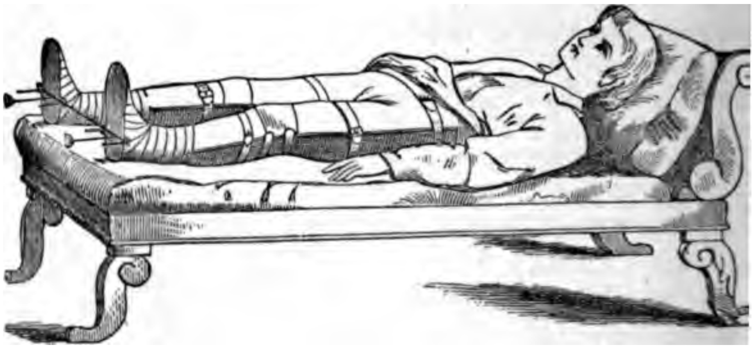
FIG. 90.



Wire-breeches for treating hip-disease.

rests pretty heavily on the tuberosities of the ischium; and belt should surround the upper extremity of the apparatus an the body of the patient to keep the machine adjusted. The wel leg is to be relieved from confinement every few days, moved i all directions, and rubbed to obviate ankylosis or stiffness of th

FIG. 91.



Patient confined to the "wire-breeches" apparatus.

joints. At the end of a month or six weeks the limb which h undergone excision is to be unbound and moved passively eve day or two. At length the wound heals, the exsected fem makes connections of a ligamentous nature with the acetabulu and the patient, by the aid of crutches, begins to walk; an finally, in favorable cases, no marked deformity is left, and t patient moves about with ease and comfort, the disease having been obliterated, and ankylosis escaped. In fact, there is little danger of the latter complication.

Dr. Sayre has exsected the hip-joint of children, for the advanced stages of morbus coxarius, in over fifty instances, and the results have rarely been unsatisfactory. Instead of its being a formidable operation, as once supposed, it has proved one of the simplest of the graver operations in surgery.

In comminuted fractures of the head of the femur, and gunshot injuries of the hip-joint, excision is far preferable to amputation. The operation, when performed for the removal of fragments of bone, instead of chronic disease, may leave the trochanter major, if possible, as the muscles inserted into it serve to govern the movements of the leg.

Before leaving the subject of excision of the joints, I would urge, in cases of suppuration and ulceration of the articulations, that free incisions be practiced before a resort be had to exsection or amputation. Once it was considered a serious proceeding to open an articular cavity, though it contained pus, but later experience has taught that any of the joints may be opened by free incisions whenever the joint is distended with pus and inflammatory exudations. In what is called pulpy disease of the knee and ankle-joints, the synovial membranes becoming soft and thickened, suppuration at length supervening, free incision in places which will evacuate the cavity of the joint, quite often is followed by excellent cures. An exploring needle is to be employed to determine whether the articulation be distended with purulent and other fluids; and an aspirator may be sometimes used to evacuate liquid accumulations.

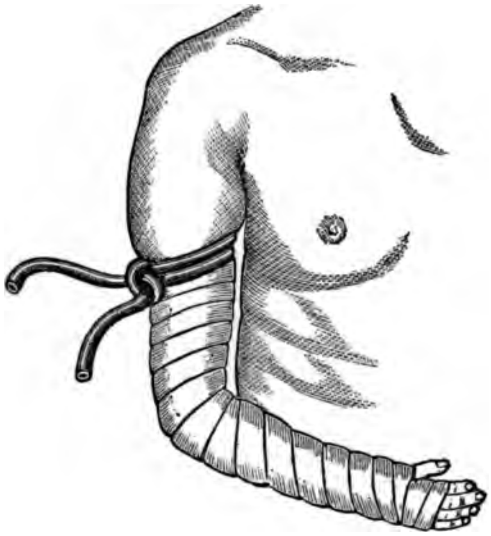
SECTION X.

AMPUTATIONS.

The removal of hopelessly disordered parts for the purpose of saving life, and of improving the condition of a patient, is one of the truly legitimate of surgical operations. Although amputations were performed by the surgeons of antiquity, the operative procedure did not attain a creditable degree of scientific accuracy until near the close of the last century. The Grecian and Roman surgeons did little better than to lop off extremities that were already dead and falling; and all through the Middle Ages little progress was made except to strike off a limb with a guillotine, and to sear the stump with a hot iron, or to seal it with hot pitch. At length Ambrose Pare devised the use of the ligature, yet there was little practical application of the discovery for a century. Hildanus advocated the *cauterium cultellare,* or red-hot knife, to seal the vessels as they were divided. The invention of the tourniquet was a long stride in the way of improving the processes of amputation, for the means of controlling flowing blood gave the operator an opportunity to study the ways of bettering the condition of the stump. After the perfection of the tourniquet and the ligature, it seemingly lacked anæsthesia to render amputation a completed branch of surgical practice. However, there are still controversies in regard to the shape of flaps, and other unimportant details; and it is possible that great improvements are yet to be made. The introduction of the elastic bandage by Esmarch is thought to be one of the most valuable improvements in the art of amputation. The blood is driven out of a limb by wrapping it snugly with a rubber bandage, beginning at the fingers or toes, and bandaging upwards to a point where the artery can be compressed with a piece of rubber tubing. Two turns of this and a knot keep the blood from coming into the limb; the bandage is then taken off, and a bluish, pulseless, bloodless limb below the rubber rope, is presented for operation. If the bandage and tubing be well applied, the severance of the limb is attended with no loss of blood. As soon as the divided arteries are ligated, the tubing is removed, to let the blood into the flaps.

In the earlier period of what may be called the modern career of amputation, the bone was sawn across two or three inches higher than the flesh was divided, and the soft tissues were incised circularly, or by circular sweeps of the amputating knife. This left a good stump, and a well covered bone, but it was attended with some delays in first cutting the integument, then the muscles, and finally using forcible retraction with a piece of cloth to drag the flesh upward, so as to have an opportunity to saw the bone at a point several inches above the division of the skin. To obviate these different steps in the operation, the procedure was modified by transfixing the limb with a pointed knife, and cutting downwards and outwards, so as to make two flaps several inches long. The wedge-shaped flaps are turned up while the bone is sawn across at the bottom of the wound, and then the edges or borders of the flaps, after the arteries have been tied, are brought in apposition with sutures and plasters.

FIG. 92.



Esmarch's elastic bandage and rubber tubing applied.

The flap operation is not necessarily restricted to flaps of equal length, but one may be short and oval, while the other, reaching down into sound tissue, may be long enough to compensate for the brevity of the other. It not unfrequently happens in a lacerated wound, and in some cases of gangrene, that one side of a limb will only admit of a short flap, while the other side may allow of more than half of a covering for the bone. Conservative and liberal surgery sacrifices nothing to any fixed plan or method of execution, but makes the most of every case, having in view safety to life, and usefulness of the stump and limb.

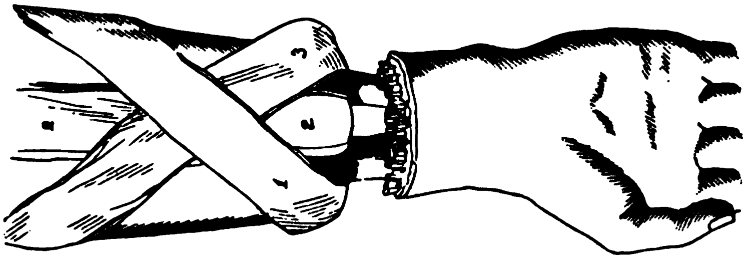
The surgeon always makes a liberal estimate for covering the bone, especially in young subjects whose muscles shrink or contract very much. An inexperienced operator is apt to get his covering too scant, particularly if he adopts the circular method of amputating. It would be foolish, however, in an effort to avoid a scanty covering, to make the flaps or soft structures unreasonably long. Nothing appears so puerile in a surgical result, as five or six inches of unnecessary covering. The loose and unsupported mass flaps about, and diminishes the usefulness of the remnant of limb. Four or five inches of covering, after the bone is removed, are usually enough, and even less will generally do. If the covering be too scanty, the cicatrix will connect with the end of the bone, remain scaly, tender, and liable to be bruised.

Ordinarily no weight nor pressure is received on the end of a stump when an artificial limb is worn, but the socket of the substitute fits the limb above the covering to the bone, and takes its bearing on the protuberances of the joint above. Mr. Teale, of Leeds, England, devised a covering which may take the bearing of the weight of the body on the end of the stump. His method is as follows: Having ascertained by measurement the semi-circumference of the limb where the bone is to be divided, he first traces with pen and ink upon the skin four dotted lines of the length obtained by the measurement; two longitudinal, extending downwards from the point measured along the sides of the limb, and two transverse, of which one joins in front the lower ends of the longitudinal lines, while the other runs across behind from one longitudinal line to the other at the distance of a quarter of their length from their upper extremities. Two rectangular flaps of very unequal lengths being thus mapped out, he raises them by cutting from without inwards, and saws the bone at their angle of union; then, after tying the vessels, bends the long anterior flap upon itself, that it may "form a kind of pouch for the end of the bone," turning up its lower edge to meet that of the short posterior flap, to which it is carefully adjusted and united by a few points of suture, some stitches being also introduced where the edges of the skin meet at the sides of the stump.

In America, especially in private practice, the ordinary flap operation is generally performed; and the results are so commonly satisfactory that no other method is likely to supercede it. The plan of Mr. Teale is attended with too much trouble and delay, and no artificial leg-maker here cares to take a bearing upon the end of the stump. There is no serious objection to the common circular method, except the greater length of time required to perform it. The two pouting angles that follow bringing the edges of the integument together in a circular operation, soon retract and leave a handsome stump.

It having been decided to amputate the forearm, for instance, a vial of chloroform is needed, a tourniquet, an amputating knife with a blade six inches long, a saw, bone nippers, artery forceps or tenaculum, scalpel, sponge, ligatures, sutures, glover's needles, bowl of water, and some soft pieces of old cloth. The operator needs a professional assistant, though he may get along quite well with two or more unprofessional persons as waiters. The patient upon a lounge, table, or bed, in a good light is to breathe the vapor of chloroform until stertor is heard, then the tourniquet is to be applied to the brachial artery, or the professional assistant is to compress the vessel with his fingers and thumbs, or Esmarch's elastic apparatus is used; then the surgeon places the forearm in a state of supination, and after raising the flesh from the bones at a point where amputation is to take place, he transfixes the soft tissues close to the bones on the anterior aspect of the limb, and cuts downwards and outwards, making an oval yet wedge-shaped flap four inches long. This incision divides the radial and ulnar arteries, yet these vessels are not to be tied at present unless they bleed. The knife is now to be entered again at a point where it began to cut in making the first incision, and pushed through the limb on the other side of the bones, the point of the instrument emerging at the same spot it did while making the primary cut. The knife is now carried downward and outward until a flap the size and shape of the first is made. A scalpel is next made to divide the interosseous structure and any uncut tissue around the bones. A piece of cloth, called a retractor, a foot long and six inches wide, having one end twice torn as far as its middle, so as to make three tails, is applied to the traumatic surfaces by having the middle tail put between the bones and the side tails against the two flaps. By gathering the three tails together, and pulling upward upon them and the other end of the retractor, the soft tissues are protected from the saw-dust, and the bones uncovered as far as practicable.

FIG. 93.



Three tailed piece of cloth used as a "retractor,"

The operator applies the saw to both bones, close to the retractor, and by gentle strokes he saws off the radius and ulna at the same time. If a spiculum of bone projects beyond the sawn surface, the bone-pliers are used to remove it. The retractor is now removed, and the ends of the arteries are tied after being picked up with a tenaculum or toothed forceps. This is an important though not difficult part of the procedure. The open mouths of the arteries will be seen near white nerve-cords, when they are to be seized and pulled out of the flaps for a half inch or so, that the trunks may be cleaned, examined, and tied. A piece of saddler's silk a foot long is commonly employed as a ligature. An assistant usually applies the ligature while the surgeon holds the artery. The knot is made by putting one end of the ligature twice under the loop for the first half of the tie, and once for the second half. After the arteries are all tied, the tourniquet is unscrewed so as to let the blood into the arteries. If an artery of considerable calibre is not tied the jet of blood will disclose it, when it may be seized and tied. One end of each ligature may now be clipped within a half inch of the knot, and the other is left until it comes away with the loop. If the ends of nerves project unduly from the flaps, scissors may be used to clip them off. It is not well to have the ends of nerves get involved in the cicatrix. The edges of the flaps are now held in apposition, and several sutures are to be so inserted as to hold the borders of the flaps together. The first suture is usually inserted in the middle of the wound, and then two more in the middle of the two sides, the ends of the ligatures on the arteries being allowed to hang out between the sutures. The same kind of silk may be used for sutures and ligatures, though I prefer fine silver wire for closing the wound. An inch space may be left between sutures, or even a greater distance; and strips of adhesive plaster six or eight inches long, and a half inch wide, are to be applied across the edge of the wound between the sutures. These hold the traumatic surfaces of the flaps in juxtaposition, and thus favor union by the first intention. The spaces occupied by the ligatures generally afford plenty of opportunity for discharges of pus and other fluids.

The dressing should be light. A piece of old muslin two feet long and a foot wide, may be doubled and applied to the stump, as a stall for a thumb; then a ribbon or fillet of cloth is tied around the upper end of the covering, to hold it in place. The stump thus dressed may be laid on a cushion or pillow. The patient is allowed to come out of the anæsthetic state as soon as the arteries are tied; though the introduction of the sutures is attended with pain, it is of a kind that can be endured. A mixture of chloral may be left for the patient in the event much pain succeeds the operation. Commonly no anodyne is needed. No arnica, alcohol, water, or other lotion is to be applied to the wound; and the dressing is not to be removed for two or three days, unless some unexpected state or condition calls for an examination of the stump. The discoloration of the wrapping with sero-sanguinious fluid may be hidden by spreading a fresh napkin over the stump every few hours. The re-dressings may occur every day or two, after the first; the adhesive strips may be removed on the fifth or six day, and others applied. On the tenth day the sutures may be clipped and removed. The adhesive strips may be employed for fifteen days, then the wrapping is to be held in position by a few turns of a bandage. In five or six weeks the stump is entirely healed, and may be encased in a buck-skin cover made like a glove-finger.

I have described an ordinary amputation from beginning to end, in order to have the different steps in the operative procedure so detailed that the inexperienced might comprehend them at a glance. It does not require the highest order of surgical talent to execute an easy amputation, but it does demand a great deal of experience and the most discriminating and decisive character to determine when an amputation should or should not be performed.

When it is plain that an amputation will have to be performed sooner or later, the occasion for delay should be urgent, for the quicker the operation is executed the better will be the result in the majority of instances. In gun-shot wounds and compound fractures and dislocations it may be well to wait a few days to ascertain how much recuperative power there may be in the patient, yet in some cases the mistake of waiting too long might be made. In the event of well developed gangrene following an injury, the line of demarcation should not be waited for, but a severance of the limb should take place at once. In senile gangrene there is usually no occasion for haste, though an amputation performed early does as well as one executed later. As the disease commonly depends upon embolism of the arteries, the separation of the limb may be made as soon as it can be determined how high the vascular difficulty extends. When amputation is performed to get rid of the active part of a carcinomatous disease, the operation may be executed at a convenient time, though it is rare that anything is gained by delay. Amputations performed to remove incurable ulcers, necroses, and deformities, may be undertaken when the conditions are most favorable, regard being had for extremes of weather, personal comforts, and the various contingencies of life.

In cases of tetanus amputation should be performed at once, if there be any hope of recovery. In rail-road accidents of a severe character, in which the limbs are crushed, and fearful injuries caused by heavy and swift moving machinery, amputations are generally required, and the sooner the operation is done the better, unless a little time be given for reaction, or recovery from the shock. In some instances it seems impossible to overcome the vital depression with heat and ordinary stimulants, therefore an anæsthetic may be the quickest agent to promote re-action. I was once called to a man who had continued delirious and vitally depressed for fifteen hours after a crushing injury of the knee, though whisky and other stimulants had been actively plied. The pulse was quick and thready, and there was a ghastly appearance of the countenance that betokened speedy dissolution; but as soon as I began to administer chloroform the pulse became softer and fuller, and the features of the face changed for the better. I amputated as soon as the anæsthesia was moderately profound, and the patient made a good recovery.

When the main artery of a limb is lacerated or severed, in combination with a serious traumatic state, there is not much hope of recovery without an amputation. In such a case the supply of blood is cut off, the nerves are probably mashed, and gangrene may be rationally expected. However, in such a case, unless hemorrhage decide upon immediate action, it may be well to wait for re-action. In one case that came under my care, a boy had his leg, just above the ankle, badly broken and bruised by the passage of a street rail-road car wheel over it. The foot was deadly cold, pale and pulseless, yet in twelve hours vital warmth had returned to the foot, and other signs of returning life were appreciable. The boy was gently stimulated, and his foot was wrapped in cotton, and a jug of hot water placed near it. In twenty-four hours from the injury the condition of the limb was such that further attempts to save it seemed justifiable. The lad recovered without amputation, and the foot and ankle were more serviceable than any artificial limb could possibly be.

In the *New York Medical Times*, for November, 1853, are some pertinent remarks by Dr. John Watson, concerning railway accidents, which later experience has sustained: "It is apparent that the crushing effect of rail-road injuries, among the deeper tissues of a limb, is usually out of all proportion to the apparent amount of injury on the integuments; and that, from these deceptive circumstances, attempts are often made to save limbs, which, from the first, are so far disorganized as to leave no chance for their recovery. And, again, even where the knife is employed early, and carried through tissues which, to appearance, still retain their healthy structure, inflammatory re-action which follows, is occasionally so severe as to lead to gangrene; which, if not arrested, may necessitate a second operation at some point higher up; or result in high irritative fever, and, finally, in the death of the patient. The primary amount of injury is not in proportion to the later consequences that too frequently result from it. The surgeon, looking at a foot with one or two of the toes crushed, may, perhaps, dismiss all solicitude; and yet, before he is aware of the true aspect of the injury, the whole is changed, and the case has assumed the gravest character; inflammation has crept up deeply beneath the fascias of the leg, the tension of the tissues interferes with the circulation; the deeper structures are deprived of their vitality, and the whole limb is implicated in the diseased action.

"The process of re-action, with, or without the spread of the disease among the deeper tissues, leads also to diffuse inflammation of the skin. This may assume the form of erysipelas, or be mistaken for it. In many instances it is only such in appearance. It corresponds with it, however, in this, that in neither of them is there any barrier set up, by the effusion of fibrine, against the spread of the disease.

"The spread of ecchymosis from extravasated blood, in these cases, is generally extensive, giving the greater part of the limb—especially in the track of the larger vessels, and among parts where the cellular tissue is lax—a deep purplish discoloration. These changes in the color and condition of the skin, from their disposition to extend, are also often taken for erysipelas, and, as I think, erroneously.

"The practical deductions, then, from the foregoing observations, are, that the amount of injury from rail-road accidents is apt to be under-estimated; that the shock is often such as to destroy the vitality of parts in the neighborhood of the tissues first hurt; and that, if the injured parts are to be removed, the sooner the operation is performed after re-action, and the greater the care of the operator to keep at a respectable distance from the immediate line of disorganization, the better for the safety of the patient."

There is so much *eclat* attending an amputation, so little trouble to the surgeon in the curative process, and so much watching needed to save a crushed limb, that the temptation to amputate is too great for any but a naturally conservative surgeon. I have been summoned long distances to amputate limbs, and when the cases were examined I have in several instances decided to try to save them, and never failed in such efforts except in one case, and in that the patient did not have good attention.

The impression prevails among medical men that the danger from amputation is not great, but tables constructed from the records of large hospitals show that one in four of amputations at the shoulder-joint turns out fatally, and one out of two at the hip-joint; in amputations of the arm one case out of seven dies; and one out of four or five fails to recover after amputation of the thigh; the death rate following amputation of the forearm is one in eight, and one in six for the leg. It will be seen that the larger the limb, and the nearer the amputation is to the trunk, the greater the fatality; and amputations of the leg are attended with a higher rate of fatality than amputations of the upper extremities. In some hospitals the death-rate is considerably higher than that given above. In country practice it is not easy to ascertain the death-rate, but I am inclined to think it is not much more favorable than in the average of hospitals. In private practice unfavorable results are seldom reported; and the inclination on the part of surgeons is to ignore and forget cases that have terminated fatally, and thus to cultivate an impression in their own minds that their practice is more successful than it really is.

When amputations are performed in consequence of severe injuries the fatality is greater than that which follows amputations to remove diseased and distorted limbs. Since the introduction of anæsthesia the rate of fatality attending amputations has increased, yet the bare statement is not strictly just for the effects of anæsthetics. Much more unfavorable cases are now operated upon, inasmuch as an attempt to save life can be made without inflicting pain.

If an amputation be performed to remove a malignant disease and the stump heals, though the patient die in six months from a re-appearance of the cancerous affection, the death is not to be charged to the amputation, yet the unprofessional will say, "the operation did no good," or that "the amputation hastened the fatal result."

Persons with distorted and ankylosed limbs often demand relief at any risk or sacrifice, though their life and general health be not in any manner endangered; but the surgeon should be cautious about performing amputations of expediency. Velpeau states that "in 1821, there was admitted into the Hospital of St. Louis, a man of robust make, in the vigor of age, and in other respects enjoying the most flourishing health, but with the firm resolution of having his thigh cut off for ankylosis of the knee, which obliged him to use a crutch. After having remonstrated with him in every possible way, and traced out to him as black a prospect as could be portrayed of the dangers to which he would be exposed, M. Richerand finally acceded to his entreaties; the amputation was one of the most simple; no local accident supervened; but a toxic fever, which soon came on, ended, nevertheless, in death on the fifth day. Pelleton and Roux cite similar cases."

Notwithstanding the high authority just quoted, I would not condemn a patient to endure for life a distorted digit which prevented him from acquiring a livelihood, or compelled him to abide in a state of disgust with a deformity that in all reasonable probability could be removed without more than ordinary risk in minor operations. I have amputated fingers that were anchylosed in a state of flexion, the growing nails being forced into the palms of the hands, and provoking incurable ulcers. I have also amputated toes which were so distorted that painful corns were produced and perpetuated, and an ordinary shoe could not be worn; I have amputated to get rid of hands and feet which were horribly distorted by the cicatrices of burns.

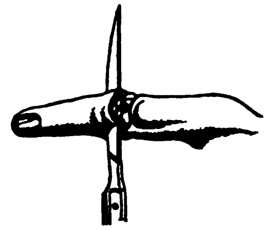
AMPUTATION OF THE UPPER EXTREMITIES.

Amputations of the upper extremities do better than similar operations upon the lower, the advantage apparently arising from a better vascular supply and superior vital power. It is as safe to amputate the shoulder-joint as to cut off the leg below the knee, though in the former operation the larger wound is inflicted, and more of the body is removed. The upper extremity is less liable to unpleasant complications when subjected to amputation than the lower—there is less danger of phlebitis, erysipelas, exfoliation of the bone, and nervous pains in the stump.

It is not a difficult affair to remove a finger, and have a good stump left, or a satisfactory result, yet a little attention must be given to the operation in order to execute it quickly and elegantly. The last phalanx rarely needs removal, though crushed or disorganized. It may be necessary to exsect the bone, yet the pulp which is not destroyed, serves to form a useful end to the finger. In severe "bone felons" the ungual or terminal bone is often lost, yet the end of the finger in time proves to be serviceable, retaining a delicate sense of touch, and much of its original appearance.

The second phalanx may be amputated near its middle or at the second joint. If in the middle an oval cut may be made with a scalpel or bistoury across the dorsal aspect of the finger, the convexity extending towards the end of the digit; then the knife may be made to transfix the soft tissues beneath the bone, and to cut a good flap from the ample structures on the under side of the finger. This under flap may be much longer than the oval one on the dorsal aspect of the finger. The arteries are in the lateral parts of the under flap, and rarely demand ligaturing. After the flaps are turned back, and any remaining soft tissue is divided, the bone may be separated with a phalangeal saw or bone-pliers. The latter instrument is quickest used, and rarely shatters the bone. The edges of the two flaps may now be approximated with three sutures—one in the middle, and one on each side,—and some short and narrow strips of adhesive plaster. An ordinary stall or wrapping for a sore finger, completes the dressing. If the amputation be executed at the second phalangeal articulation, the operative procedure is not essentially different from that just described, except the lateral ligaments are divided after the dorsal flap is made and dissected back, and disarticulation is so far produced that the scalpel or bistoury placed behind and beneath the dislocated phalanx, completes the separation by forming the under flap—no saw nor bone-nippers being required. The flaps are brought together, and the dressing applied as in the case already described. The hand and arm should be carried in a sling during the healing process, and a re-dressing should be performed every second or third day.

FIG. 94.



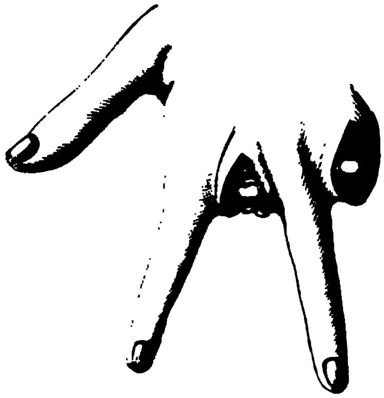
Amputating finger at second joint.

FIG. 95.

Stump of finger dressed with adhesive strips.

Amputation of an entire finger, or the removal of a digit at the metacarpo-phalangeal articulation is quite easy, but better be performed by lateral instead of antero-posterior flaps. The middle finger may be selected for the description. The fore and ring-fingers being held away from the one to be amputated, the operator places the point of his scalpel on the prominence of the knuckle and cuts towards the middle of the web between the fingers, but before quite reaching it the knife is turned inwards to the centre of the fold between the finger and the palm, and after making a similar incision on the other side, the disarticulation is completed by a few touches of the knife. The side or lateral flaps come readily into apposition by the approximation of the adjoining fingers, which, while the operation was going on, were held apart, but now are to be bound together. Very little deformity results from this operation, the hand appearing narrower and tapering; there is no reason for cutting away the head of the metacarpal bone, unless it be diseased.

FIG. 96.



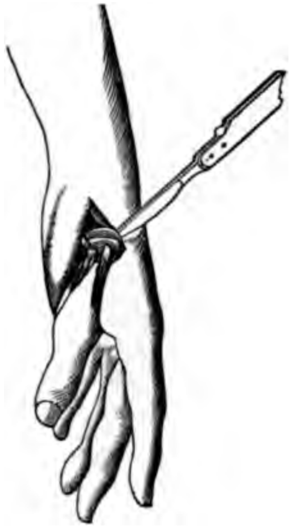
Amputations at the metacarpo-phalangeal articulation.

If the forefinger is to be amputated, the web that goes to the thumb is not to be a guide for the termination of the cut on that side, but the incision is to reach higher on the finger, or on a level with the web between it and the middle finger. In fact, the forefinger is so valuable that a piece of the phalanx, with soft tissue enough to cover it, is to be saved if possible.

The thumb is so necessary to the hand that in cases of disease or injury as much of it as possible should be saved, therefore no rules for amputating at the joints or in the continuity of the bones are applicable. The rule for amputating the thumb at the metacarpo-phalangeal articulation is to take the flap from that side where most can be obtained. Sometimes two oval cuts will save most, and at others a semi-circular incision for half the way, and one which will make a long flap for the other half will do best. If it be necessary to remove the thumb at the carpo-metacarpal articulation, two incisions beginning at the web and extending on each side of the member to a point over the articulation, and carried deep enough, will readily allow of disarticulation and removal. The edges of the wound easily come into apposition where they may be held with sutures and strips of adhesive plaster. Probably an artery will have to be tied before the flaps are brought together, yet a pinch and a twist of bleeding vessels will generally arrest the flow of blood.

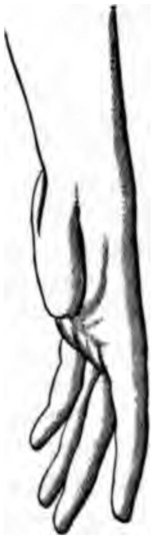
All four fingers can be amputated, if necessary, by a process different from that of cutting away one finger at a time. An assistant holds the hand while the operator takes hold of the dead or mutilated fingers and cuts a half inch in front of the metacarpo-phalangeal knuckles, beginning at the forefinger if operating on the left hand, and at the little finger if on the right hand, making a semicircular sweep across the back of the fingers near the hand. After the integument is thus incised, the extensor tendons divided, and the ligaments of the joints severed, the disarticulation is readily accomplished, so that a long narrow knife can be insinuated below the bases of the phalanges, and there be made to cut a flap from the palmar aspect of the base of the fingers. There would not generally be any arteries to tie, yet if troublesome bleeding was persistent, ligatures should be employed. The dressing consists in approximating the flaps with

FIG. 97.



Amputation of thumb at the carpo-metatarsal articulation.

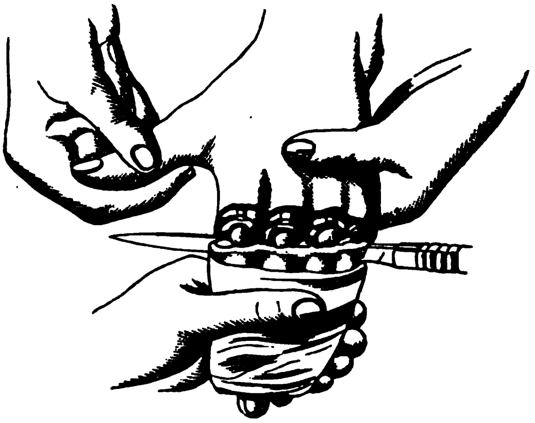
FIG. 98.



Stump of thumb after amputation.

sutures and adhesive strips, and covering all the hand with a wrapping of patent lint and a bandage. The stump might be supported on a pillow for a day or two, then carried in a sling

FIG. 99.

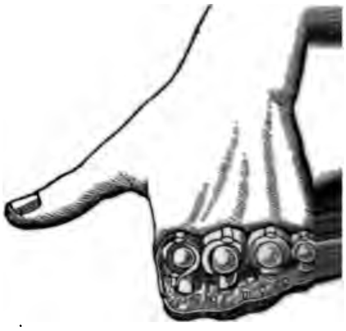


Amputation of all of the fingers at the metacarpo-phalangeal articulations.

At length a buckskin pouch might be made to cover the tender stump.

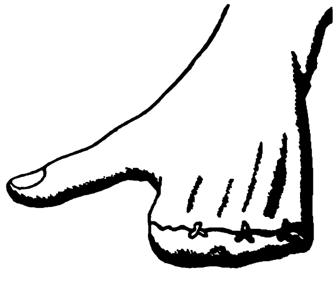
If two or three fingers require amputation instead of four, the operative procedure is of the same general character. Although digital amputations are comparatively simple, they may turn out seriously, and even fatally, when inflammation and suppuration get into the sheaths of the tendons. If relief is promised by deep incisions, to set free accumulations of poisonous fluids, the knife should not be spared. I have opened abscesses in the deep structures of the anterior aspect of the forearm near the wrist, which came from crushing injuries of the fingers and amputation of some part of the hand

FIG. 100.



Amputation complete.

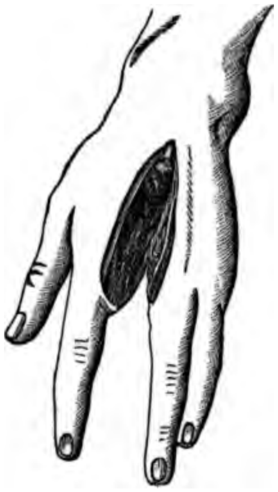
FIG. 101.



Flaps adjusted with sutures.

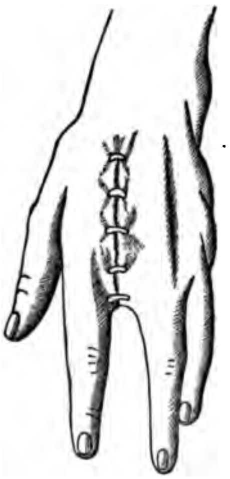
mputation of the metacarpus may be executed in the shafts ntinuity of the bones, or at their junction with the carpus; it must be borne in mind that a part of the metacarpus, for nce that part supporting the little and ring fingers, may be tated, should circumstances permit, and the remainder of hand saved. In one case I away the three outside fingers a corresponding part of the carpus, and preserved the fore- r and thumb. When one r with its metacarpal bone is ved, the operative procedure ore like re-section than ampu- n — the metacarpal bone is n out through a straight inci- made along the dorsal aspect e bone. In this operation a l is a useful instrument to the bone, disarticulate it, and it out of the wound. If the re of the disease or injury necessitates the removal of netacarpal bone, there is noth- gained by attempting to save inger, for the digit is unsup- ed at its base, and often worse useless in its dangling state. amputations of the meta- us, the palmar arches are likely e divided, and will generally ire ligation. In fact, the arte- complication is such that much may be needed to secure all bleeding vessels. The radial ulnar arteries better be com- sed during the process of ampu- n. In the approximation of dges of the wound, care should be exercised that the divided of tendons and nerves do not omplicated with the cicatrix.

FIG. 102.



Amputation of middle finger at carpo-metacarpal articulation.

FIG. 103.

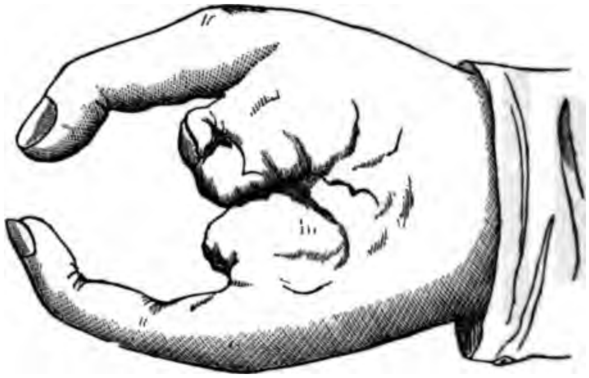


The wound drawn together with sutures.

When the metacarpal bones are divided in their continuity, it is better not to use a saw, but bone-pliers to effect a division.

As has been indicated, the metacarpus may be amputated, and the carpus saved. The inexperienced surgeon, following treatises on surgery that do not make this distinction, might deem it best to take off the whole hand when there was no urgent necessity for such a course, not thinking that the vestige of a hand is generally preferable to none. Amputation at the carpo-metacarpal articulation is accomplished by making two flaps, which may be oval on the dorsal and palmar aspects of the hand.

FIG. 104.



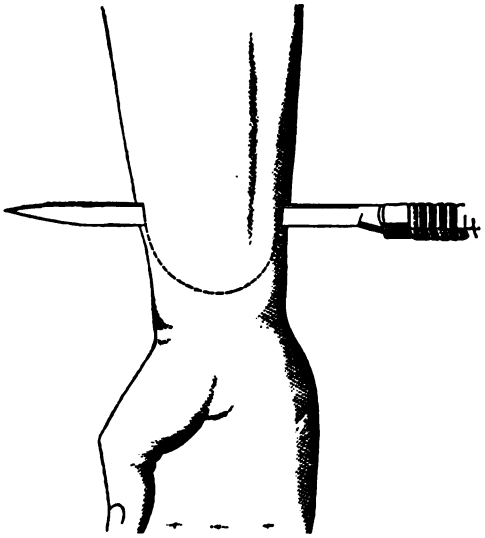
Thumb and little finger saved; and metacarpus cut away by action of cogs. All saved that could be.

Amputation of the wrist at the carpo-radial articulation is accomplished by transfixing with a slender catlin the soft tissues on the dorsal aspect of the wrist just in front of the styloid processes of the radius and ulna, and making a flap an inch or so in length, the hand being bent backwards to relax the extensor tendons. As soon as this flap is made a scalpel or bistoury is employed to cut the lateral ligaments and such tendonous or ligamentous structures as remain undivided on the dorsum of the radio-carpal joint, the hand being forcibly flexed while the disarticulation is being effected. The catlin is now placed beneath the carpal bones, and a palmar flap is made of a little greater length than the dorsal. These flaps cover the styloid processes which remain prominent, but need not be removed. As the radial and ulnar arteries are quite large at the wrist their divided ends will need ligatures; and the brachial should be compressed while the amputation is being executed. The flaps should be brought into apposition with sutures and plasters, and the wound dressed and treated as after amputation of the fore-arm. The stump admits the adjustment of an artificial hand, though such substitutes are rarely valuable.

AMPUTATION OF THE FORE–ARM.

In amputations upon the upper extremity the law is that we should amputate as far from the trunk as possible, and especially is it urgent that we save as much of the fore-arm as practicable. To be sure, the lower part of the limb is full of tendons, and the upper part is muscular, yet the integument alone is enough to good covering for the ends of the bones. A surgeon would be censurable if he sacrificed several inches of the fore-arm just to get what he might deem a fleshy covering for the ends of the bones; but he should provide for plenty of integument whether he adopts the circular or flap method of division.

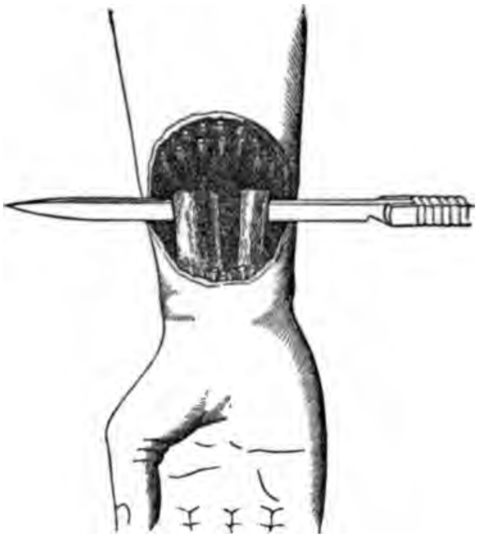
Fig. 105.



Making the first flap in amputating the fore-arm.

The operative procedure is begun by anæsthetizing the patient and controlling the circulation in the brachial artery. Esmarch's elastic bandage may be employed, or a common tourniquet to prevent hemorrhage, or a reliable assistant may compress the artery with his fingers and thumbs. A second assistant, if the first be employed to attend to the circulation, supports the forearm and pulls the skin towards the elbow; the operator seizes the integument with his thumb and finger on the ulnar and radial sides and elevates the soft tissues at a point where a section of the bones is to be made, and thrusts the blade of the amputating knife through the arm on a level with the bones and cuts downwards and outwards whether the first flap is made on the back or front of the limb—the flap in a young subject should be fully two inches in length. The arm is now pronated or supinated, as the case may be, and the knife is entered at the primary wound in the integument, and sent through the limb on the other side of the bones, the point of the instrument emerging at the original wound of exit, and by a sawing motion is made to make a flap which with the other will easily cover the ends of the bones after they have been divided. A scalpel is employed to cut the interosseous ligament, and such soft structures around the bones as have escaped division. A piece of wide bandaging, with one end torn into three tails may be employed as a retractor, or medium for pulling back the flesh so the bones may be sawn as high as possible. The saw is placed upon both bones, and drawn towards the operator to start a channel in which the implement may be made to cut its way without sliding out of the groove thus started. While using the saw the operator sup-

FIG. 106.

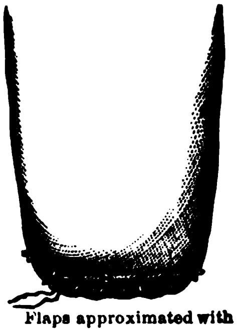


Making the second flap in amputation of the fore-arm.

ports the arm, and an assistant the part to be removed, or, *vice versa;* and the holding, on the part of both, should be steady, or the saw will get pinched and fail to move easily. There need be no haste in the movements of the saw, nor in executing any other part of the operation. The patient is not under torture as in the days before anæsthesia was discovered. Then the surgeon's work was timed, and his skill was rated by the rapidity of his performances. At present a surgical operator aims only to work well.

After the bones are divided, and spicula clipped off with bone-nippers, the arteries are tied, and the blood let on. Then the flaps are inspected, and if any nerves or tendons project too far they are shortened with scissors. The edges of the flaps are drawn together with five or six sutures, several adhesive strips are applied across the wound, but not so as to press upon the out-hanging ligatures, and the stump is ready for the cloth covering and a bandage, or fillet tied over the wrapping, which concludes the dressing. The stump is laid on a cushion or pillow, and no lotions applied. Too much meddling and re-dressing may do harm, therefore the dresser is to avoid over-doing in his attentions. Drainage should be secured, or pent-up fluids will do irreparable mischief. Generally the drainage follows the ligatures which always have a loose space to rest in.

FIG. 107.

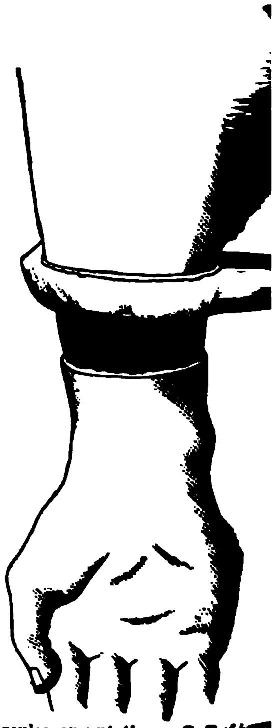


Flaps approximated with sutures.

The circular method in amputations of the fore-arm is scarcely inferior to that by flaps. An assistant draws up the integument, while the operator with a single sweep of the knife cuts clear round the limb at a line an inch or more below the point where section of the bones is to take place. With a few touches of the knife and the use of the fingers, the skin, fascia, and cellular tissue are slid upwards a half inch or more, then the knife is by another circular sweep made to cut the muscles and tendons to the bones. A scalpel is employed to cut the interosseous ligament and other soft structures around the bones; a retractor, with the middle tail between the bones, and lateral ones placed against the flesh so as to cover it all, is used to force the soft structures upwards while the saw is employed to sever the bones.

In using this implement it is well to begin with the radius and to end with the ulna, though the saw-cut is kept along pretty even in both bones. After the spicula are excised, the arteries tied, and nerves clipped, the antero-posterior lips of the wound are brought together, and joined with sutures and adhesive strips, the ends of the ligatures being allowed to hang out at some point. Now, at the radial and ulnar sides of the wound, prominent angles invite the use of scissors, but these projections will disappear before cicatrization is past. If enough integument has been saved to easily cover the ends of the bones, the stump, after a circular amputation, is very presentable, and in no respect objectionable.

Fig. 108.



Circular amputation. Cuff of integument and fat turned up.

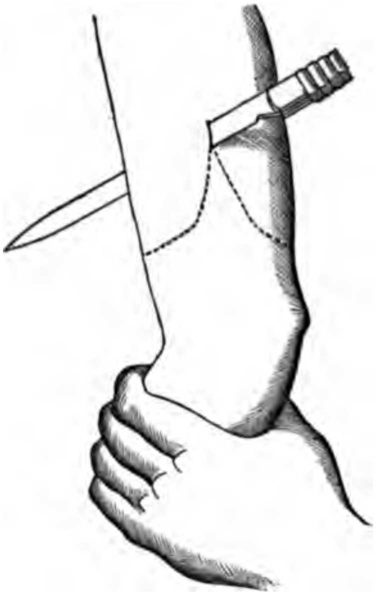
Amputation of the fore-arm near the middle of the limb or towards the elbow can be performed without difficulty by either the circular or flap method; and there is no feature in the operation that differs essentially from those of an amputation below the middle of the limb. There is a greater amount of muscle in the flaps or covering, but the muscles being divided nearer their origin there is less contraction in them. In cases of gun-shot and crushing injuries near the elbow-joint, much care will be needed to preserve an inch or two of the radius and ulna, and not open the elbow-joint. It may require consideration to find proper covering when the integument is lacerated and carried away. If there be plenty of soft tissue, and a lack of integument, the stump may do well, the cicatrix being somewhat in excess over ordinary cases.

Amputation at the elbow-joint is feasible when necessary. The most tedious and critical part of the operation is to remove the olecranon without puncturing the integument. However, in some cases a piece of the ulna, including the coronoid process, may be saved, the radius alone being wholly removed. After the anterior flap is made as long as practicable, a posterior flap may be guaged by the surface to be covered. As the ulna comes near the skin at that point, little besides integument will enter the flap. The ulna having been pretty well cleaned of flesh at a line below the coronoid process, the saw may be used to complete the severance. The lower end of the brachial will probably be the artery needing ligation, though the amputating knife may have left the brachial untouched, and divided the radial and ulnar. If those vessels be cut just below the bifurcation, the lower end of the brachial should be brought into view and tied, instead of the short and insecure branches.

If the coronoid process can not be saved, there is no advantage in the preservation of the olecranon. The triceps does not require it for the movement of the humerus, and the operation is just as successful without it. The complete articular amputation is performed by transfixing the arm on its front aspect on a line with the condyles of the humerus, and cutting downwards and outwards about two inches to make the anterior flap. The posterior flap is made not by transfixion, as the ulna is in the way, but by making a semilunar sweep of the knife on a line with the termination of the first cut, dividing integument, muscle, and other soft structures, to the bone. This flap is then dissected upwards with a scalpel, the point of which being made to divide the lateral ligaments and such other binding tissue as enters into this complex articulation. The head of the radius having been disengaged from the humerus, the fore-arm can be rocked enough to assist in disarticulating and clearing the olecranon from its attachments. The flaps will be ample to cover the trochlea of the humerus, and to form a cushion on the end of the stump.

Amputation of the arm through the humerus is the plainest capital operation in the domain of surgery. The circular or flap method may be adopted, either being easy of execution. The flap operation is the one most commonly performed, and is probably the best, especially for those not much used to operating. The point of the knife being entered on one side of the limb at a point where the flexor and extensor muscles come in contact, its course is to the bone, touching which it is turned a little to pass that obstacle, and then made to resume its course straight through the limb, the point of the instrument emerging at a place exactly opposite that of entrance. The flap is then made by cutting downwards and outwards with a sawing movement of the amputating knife. The knife is now re-entered at the original wound in the integument and made to emerge on the other side of the bone at the point of exit; the second flap is now made by cutting downwards about as far as the flap should extend and then abruptly outwards, severing the skin with a perpendicular, and not an oblique, cut. This method of making flaps in the integuments is to be followed, as far as practicable, in all amputations. An assistant retracts the flaps, and the surgeon with a few touches of the knife close to the bone makes a clean line for the section of the saw. The bone having been divided and the spicula removed, the arteries are sought, cleaned, and tied. The brachial is often the only vessel which requires a ligature. Occasionally the radial and ulnar start above the middle of the humerus; and in such a case they might for a moment puzzle an operator not versed in the vascular anomaly. Arterial branches of some importance spring from the main trunk, yet they rarely require ligation—a pinch and a twist of

FIG. 109.



Amputation of arm by the flap operation.

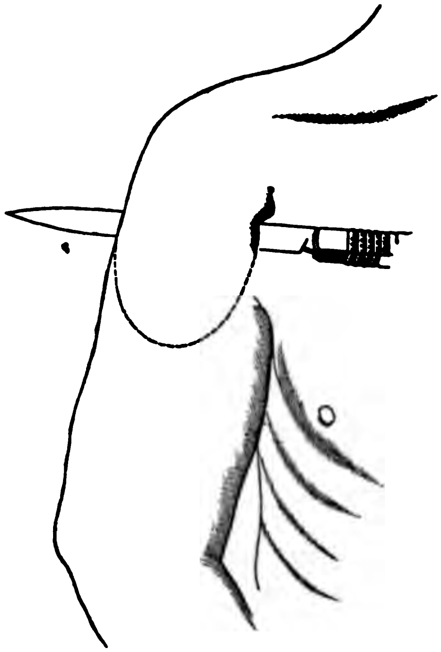
the forceps put an end to hemorrhage. The flaps are to be managed as in other amputations already described. The stump can bear the presence of an artificial limb in six or eight weeks. I may here remark that the usual contrivances made as substitutes for the arm and hand, are more ornamental than useful. A strap reaching from the substitute across the back to the opposite shoulder, holds the artificial limb in place, and affords a medium through which force is applied to the mechanism of the apparatus. By such means the thumb and fore-finger may be made to oppose each other, and to take hold of some objects. I have devised an apparatus, the lower end of which resembled a duck's bill, that would take money out of the pocket, assist in dressing and undressing, and in earning a livelihood at simple employments The bill is held open with a spring, and is closed by force coming from the shoulders through the medium of a strap and cord. A ring sliding freely on two levers like the handles of bone-forceps, serves to close the duck-bill.

AMPUTATION AT THE SHOULDER-JOINT.

Amputation at the shoulder-joint is an operation easily executed, and not especially dangerous. The inexperienced operator looks upon the procedure with dread on account of the severance of the axillary artery while no means are employed to compress the vessel. The subclavian may be compressed against the first rib above the clavicle, yet that precaution is not necessary. The arm may first be compressed with Esmarch's bandage, and then the rubber tubing can be employed to compress the axillary artery and its branches. The tubing passes through the arm-pit and over the shoulder.

The amputation may be executed as follows: An assistant supports the arm above a right-angle with the body, and the operator, standing behind the shoulder of the patient, sends a long knife between the deltoid and the bone, and makes a flap chiefly from that muscle. The knife enters the flesh below and outside of the acromion process, grazes the head of the humerus as it passes, and emerges at the prominent edge of the pectoral muscle; the flap is made by cutting downwards two inches and a half, then abruptly outwards. The wound thus made is ghastly, yet the axillary vessels have not been touched. If the circumflex or muscular branches bleed profusely, ligatures may be employed at once, but a twisting of the arteries with forceps generally proves efficient in arresting the hemorrhage. A large scalpel is next used to open the joint and free the head of the bone from its muscular and tendonous connections. The amputating knife is now placed behind or below the disarticulated humerus, and by one or two quick strokes completes the lower flap, the axillary vessels and nerves being quickly severed. One full gush of blood follows that seems frightful, but the arm is gone, and the surgeon catches the artery and edge of flap between his thumb and finger, and thus controls the arterial flow. Now, by the use of the other hand the artery is compressed a little deeper, and its mouth, or end, is exposed for ligation. The main vessel having been secured, there is little trouble in managing smaller ones. The flaps are to be brought together and fastened with sutures as in other amputations. Adhesive strips may be used between sutures, but not so as to prevent free drainage. After the ligature comes away there is little danger of secondary

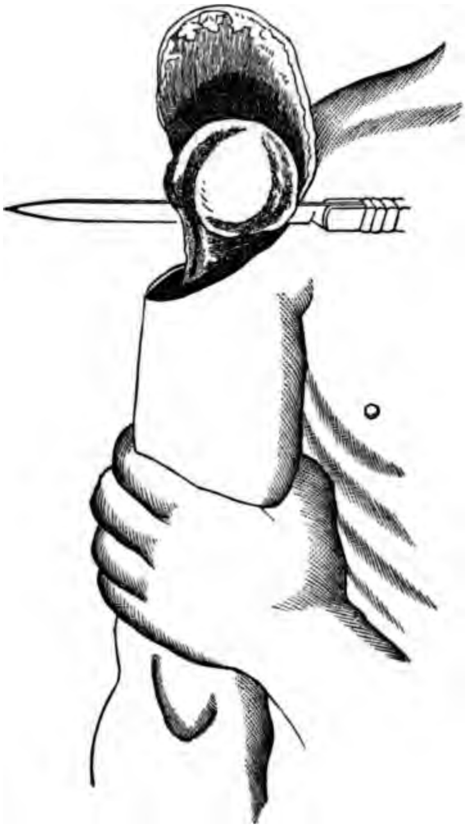
FIG. 110.



Making first flap in amputating at the shoulder.

hemorrhage, or bad complications of any kind. The wound heals in part by the first intention, but mostly under inflammatory action.

FIG. 111.

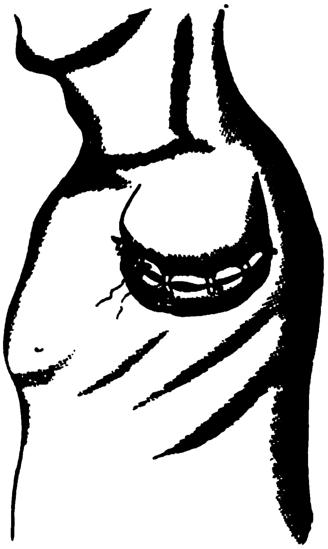


Making the second flap in amputation at the shoulder.

AVULSION OF THE ARM AND SHOULDER.

There are several cases recorded in which the arm and scapula, by the force of rapidly moving machinery, have been torn from the body. One of the most startling is that reported in 1845 by Dr. A. King, of Glasgow, Scotland. "The patient, a stout boy, aged 15, had his *whole left arm, with the scapula entire, torn off*, by his hand being caught in the wheels of a grain-mill, leaving a jagged, irregular, and ghastly wound, commencing an inch from the sternal extremity of the left clavicle, and coursing along the under third of the neck, thence downwards, forwards, and backwards, terminating at the fourth false rib anteriorly and laterally, and three inches on the *right side* of the upper portion of the dorsal division of the vertebral column posteriorly. The loss of integument was chiefly behind and below the situation of the left clavicle. The muscles on the front side of the *chest*, with the *exception of a very few fibres*, were removed, *exposing the intercostals;* they had been dragged from their thoracic attachments, leaving the skin loose and puckered, as if too ample for the subjacent textures. *No fragment of the scapula* could be discovered in its situation. The clavicle was drawn downwards and forwards, but maintained its connection with the sternum. The *axillary artery* projected from beneath the displaced clavicle, to the *extent of two inches and a half*, and pulsated strongly to within an inch of its orifice, but gave exit to no blood. On a minute examination of the torn orifices, the *external coat* of the vessel was found to be divided into three irregular pieces which encircled each other and held in their *embrace a small coagulum of blood*. There was *no venous hemorrhage, and no large venous trunk discovered.* The nerves were torn at irregular distances, varying

FIG. 112.



Flaps joined with sutures after amputation of shoulder.

from three to five inches from the surface of the wound; their extremities were *greatly attenuated,* and the *slightest* irritation upon them gave rise to the most acute suffering. The artery was secured by a ligature, being deemed, as it certainly was, the most prudent course, for it would hardly have been otherwise than an act of unwarrantable temerity to have looked for its cicatrization after the *torsion* which had been effected or forced upon it by the violence of the accident. About two inches of the projecting portion of the clavicle was *sawn* off, and the integuments were drawn together by adhesive plaster, which was made to cover without any stretching, the vessels, nerves, and indeed the whole wounded surface, with the exception of a small, irregular portion near the spine, about three inches in circumference. The patient did not even swoon, but was found *standing by the wheels,* which had been promptly stopped; and not until his tattered clothes, adhering with his torn-off shoulder and arm to the machinery, were being removed, did he evince even pain, and then complained but little. Not two cups of blood, in all, were found on the floor, and on the arrival of the surgeon, half an hour after the accident, *not a drop of blood oozed* from the frightful wound! Nor was there any hemorrhage afterwards.

"On the tenth day several portions of the integuments which had been brought over the face of the nerves, and some of the ragged margins of the wound, had separated by sloughing; but healthy granulations were springing up on all sides. The plexus of nerves, which had become exposed to the extent of three inches, lay together in a mass, and were partly sphacelous; but when touched by the dressings, or otherwise, the boy manifested a degree of terror, says the surgeon, I have seldom seen equaled, and declared he would sooner perish than allow any interference. The ligature lay in contact with the nervous mass, and in consequence of the extreme nervous sensibility of the part, was allowed to drop off with the sphacelated nerves, *about the middle of the sixth week,* after the boy had been walking about *for some days in perfect health.*"

Dr. King, who published the above account in *Cormack's London and Edinburgh Monthly Journal of Medical Science,* for Feb., 1845, says, there are a few similar cases of "Avulsion" on record. Belchier relates the case of a man who had the arm and shoulder-blade torn off by a mill. The patient complained of no pain, but of a tingling sensation about the wound, and actually did not know his limb was torn off, till he saw it in the wheel! Recovering from fright at the loss, he came down a narrow ladder to the first floor of the mill. The results of such accidents emboldened surgeons to amputate the arm including the scapula, and the results have generally been satisfactory. The causes leading to such amputations are malignant diseases of the humerus and scapula, crushing injuries of the shoulder including the scapula, and necrosis of the humerus and scapula. The operative procedure must depend much upon the condition of the parts demanding amputation. An incision made along the spine of the scapula to the tip of the acromion, and the flaps dissected back on each side would expose the shoulder-blade, and allow the fingers being inserted beneath the bone, to elevate it while its borders were freed of muscular attachments. The clavicle should then be disarticulated, the arm elevated and removed by incisions similar to those made to remove the limb at the scapulo-humeral articulation. The axillary artery is left in the lower flap, and seized and tied as soon as divided. The removal of the whole limb afterwards is a matter of a few strokes of the knife to free the bones from muscular attachments. The wound being large and irregular in outline would have to be closed the way the edges of the divided integuments came readily together. It is highly essential that free drainage be secured, and that pus be not allowed to collect in pouches.

AMPUTATIONS OF THE LOWER EXTREMITIES.

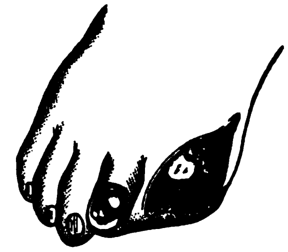
Amputations are more serious in the lower than in the upper extremities; the form and functions of the hands and feet being different, the same rules do not govern operations upon them. The toes serve chiefly to sustain and poise the weight of the body, and are not so long as the fingers.

The distal phalanx of the great toe may be removed, or the second, but the separation is effected at the articulation. However, the head of the metatarsal is so large that it is covered with difficulty, hence surgeons have advocated its removal at the same time the toe is amputated. But, while it is admitted that the distal end of the metatarsal bone is large and subject to painful callosities, its size favors the acts of standing and walking. The great toe in locomotion is more important than all the other toes, consequently it should be saved if possible, or as

ch of it as practicable. The last or distal phalanx may be ex-
d in the event of necrosis, and the flesh saved, as a substitute
amputation. In the amputation of a toe at the metatarso-
langeal articulation it must be borne in mind that the web
ween the toes extends farther in front of the joint, in pro-
tion to the size of the digit, than it does in the fingers.

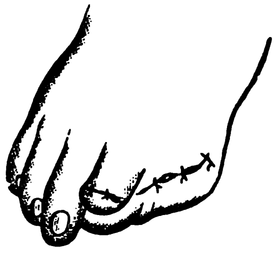
n amputating the great toe at the metatarso-phalangeal articu-
on, the sesamoid bones get in the way of the edge of the
fe and otherwise are obstacles.
calpel makes a semilunar flap in
nt of the joint, and after dis-
ting it back to the articulation,
lateral ligaments are divided,
l the toe is disarticulated suffi-
ntly to allow the edge of the
ife to get beneath the projecting
of the digital bone, when it
y be made to cut a good flap
n the lower aspect of the toe.
sesamoid bones may be left in
stump unless seemingly in the
. There being no hemorrhage,
flaps are joined with sutures
adhesive strips, and a double
r of patent lint is to be laid
n the wound. This may be
l in place with narrow strips of
esive plaster. The patient gene-
y requires an anæsthetic before
operation is begun, and an ano-
e after it is over. The healing
ess in such a wound is not so rapid as the patient naturally
ects from the diminutive size of the digit, several weeks
ng required for a cure, yet if the result be a useful and painless
t, the prolonged period of reparation is soon forgotten.
ring the process of recuperation the patient finds the greatest
e in an elevated attitude of the foot. After the wound has
led a firm shoe of ample dimensions is preferable to a slipper
the act of standing or walking.

FIG. 113.



Amputation of the great toe at metatarsal junction; and of the second toe at its distal articulation.

FIG. 114.

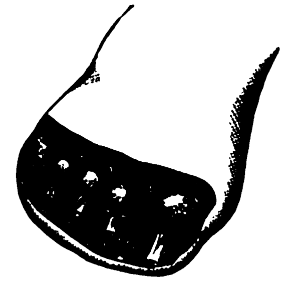


Flaps joined with sutures.

Several of the smaller toes, from frost-bite, gangrene, or
hing injuries, need amputating at the same time; and the

process is not essentially different from that by which the fingers are removed. A scalpel makes an oval cut on the dorsal aspect of the toes, so as to secure some flap when the integument is dissected back to the articulations; the ligamentous structures are then divided, and disarticulation accomplished. The removal is then effected by making a good flap on the under side of the the toes. No arteries need ligating, but several may require torsion, or a pinch and a twist with forceps. The edges of the flaps are held in apposition with sutures and adhesive strips. A pledget of lint serves as a protection to the wound, and an absorber of fluids.

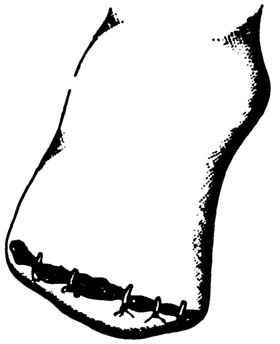
FIG. 115.



Amputation of all the toes at the metatarso-phalangeal articulation.

One toe between the great and little toes, may be amputated as is a finger. A scalpel cuts from the metatarso-phalangeal articulation to the web on each side, and then to a point in the center of the under side of the toe. The toe is then disarticulated and removed. The wound is easily dressed.

FIG. 116.



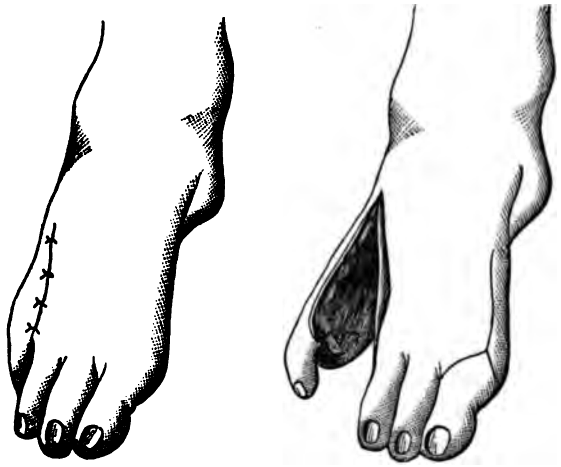
Flaps joined with sutures.

The removal of one of the middle toes and its metatarsal bone, for injury or caries, is a little tedious, but a nice piece of conservative surgery. The web is cut on each side to the base of the toe, and then a straight incision is made along the dorsum of the metatarsal bone to the tarsus. This incision is widened by dissection, and then a chisel cleans the bone, and disarticulates it. With a few touches of the point of a scalpel the separation is rendered complete. The wound is rarely hemorrhagic, and generally heals kindly, making a narrow, genteel foot, with functions scarcely impaired.

Two or three toes with their metatarsal supports may be removed after the same general plan, a dorsal incision parallel with and along the dorsum of each metatarsal bone to be removed, being necessary to effect dislodgment of the bones; and it is to be borne in mind that the metacarpal bone next the great toe sets up into the foot for nearly half an inch between the external and internal cuneiform bones. To disarticulate this is a tedious and perplexing process.

The first and fifth metatarsal bones are to be removed, together with the corresponding toes, by making incisions in the sides of the foot to the extent of the length of these metatarsal bones, branch incisions being made at the base of the toes, on each side, to effect amputation of the toe at the same time the metatarsal bone is taken from its bed. The chisel is a useful implement in performing these complex operations, as it can be made to divide ligamentous structures, clean the bones of muscular attachments, and be used as a lever in the process of disarticulation. Every amputating case of instruments ought to contain a chisel fashioned for the purposes just indicated.

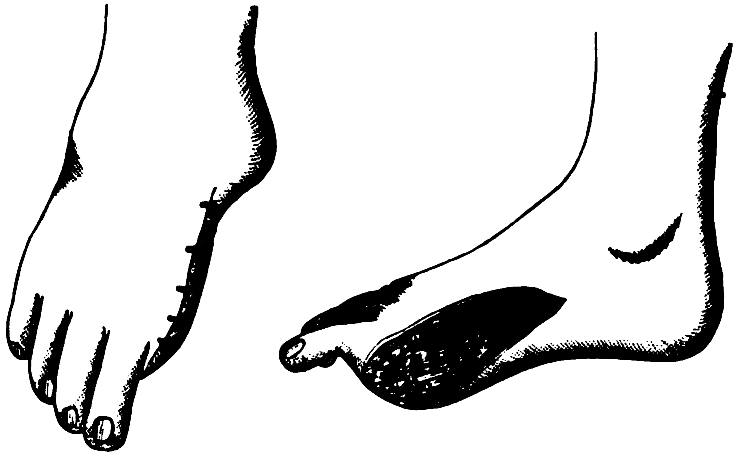
FIG. 117.



Amputation of fourth toe at tarso-metatarsal articulation.

Amputation at the tarso-metatarsal junction is strictly legitimate, but somewhat difficult to perform on account of the interlocking of the head of the second metatarsal bone between the first and third cuneiform bones; besides, the articulation is not regular the rest of the way. Mr. Hey was the first to advocate the operation, also to describe it. A semicircular sweep of the knife across the dorsum of the foot about three-quarters of an inch in front of the articulation, outlines a dorsal flap which is to be dissected back to the tarso-metatarsal junction. The point of a scalpel is employed to cut ligaments and begin the work of disarticulation. The chisel is used when the knife fails; and while the separation of bones is going on, the metatarsus is bent forcibly downwards. After the prominent eminence of the fifth metacarpal bone is freed from its articular, tendonous, and ligamentous connections, and the second is dislodged, the other bones become detached quite readily. Disarticulation having been accomplished, the scalpel is used to divide the tendon of the peroneus longus, and other dense structures, to prepare for the use of the amputating knife, which is to make a large flap out of the plantar tissues. In the execution of this amputation, the circulation should be controlled as in amputations of the leg, for the plantar arteries are to be divided. The management of the flaps and the treatment of the wound, would be substantially the same as in similar operations in other places.

FIG. 118.

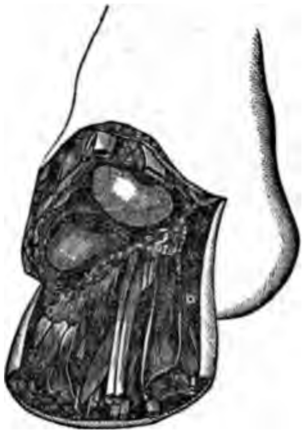


Amputation of great toe at tarso-metatarsal articulation.

AMPUTATION THROUGH THE TARSUS—CHOPART'S OPERATION.

When the bones of the tarsus, next the metatarsus are diseased or crushed, it is not a difficult matter to amputate through the tarsus, separating the os calcis and astragalus from the cuboid and scaphoid bones. This is a much easier operation than that of Hey. A dorsal incision, in a semicircular sweep, is made three-quarters of an inch in front of the articular line just mentioned. If the operator is dull in osteological points, he can look at the skeleton of the foot, or to a picture of the bones of the tarsus, in order to estimate the line of articulation—the line is about two inches in front of the malleoli. The easiest mistake is to open a way between the scaphoid and the cuneiform bones. The dorsal incision should reach well down upon the sides of the foot, and when the flap is dissected up, a light touch of the knife severs the connection between the astragalus and scaphoid, especially if the foot be forcibly depressed. The calcaneo-scaphoidean ligament, which has been called "the key of the articulation" is now seen and divided as well as the connection between the os calcis and the cuboid. A few touches with the scalpel assist in the disarticulation, when the amputating knife may be pressed beneath the tarsal bones to be removed, and made to cut a plantar flap reaching nearly to the toes. The arteries may now be tied, and the flaps adjusted and sutured. At first I was prejudiced against this operation on account of the probability that the muscles of the calf of the leg, acting through the tendo-Achillis would raise the heel and depress the stump to a degree that locomotion might be uncomfortable if not impossible. At length a case came into my hands that favored the operation, and I embraced the opportunity to try the experiment. The patient did well, and there was little disposition for the heel to rise and the tarsus to sink. The flexor tendons which had been divided, readily united to the astragalus, and counter-acted the sural muscles. After the wound was healed the patient devised a boot which he wears with wonderful ease and cleverness. While the boot is being made he has one end of a steel spring riveted in the heel, and the remainder of it extends through the shank to a point near the toe of the boot. The spring is concealed between the inner and outer sole, and is fastened only to the heel of the boot. The leg of the boot is open along its inside for a strong lacing

FIG. 119.



Flaps after amputation through the tarsus—Chopart's operation.

which when it is loosened, allows the boot to go on easy, and, when tightened, prevents it from coming off. An important part of the preparation for use and comfort, is the stuffing of the front end of the boot with raw cotton. After the shoemaker turns over the boot as finished, the wearer takes a quantity of cotton and carefully fills and distends the toe of the boot; he then puts in more cotton and tamps it with a mallet and tamping iron. When the filling reaches far enough back to meet the stump, he puts the boot to use; but he has to pack in more cotton and heavily tamp it every day for a week or two: at last the stump finds an easy place to rest, and the cotton no longer yields to the pressure of his weight. So perfect is the working of this boot that he pursues an active avocation, walking for miles some days; and so closely does the stuffed boot resemble the other that only close observers notice any difference in the appearance of his feet.

In another case that came under my professional care, the heel did rise so much that I subcutaneously divided the tendo-Achillis, which partly remedied the defect; and there are numerous cases of the kind recorded. I think a favorable result, in Chopart's amputation, depends much upon keeping the stump flexed on the leg, to prevent the upward tendency of the heel.

SYME'S AMPUTATION AT THE ANKLE-JOINT.

In the amputation at the ankle devised by Mr. Syme, the bones of the leg are divided just above the bases of the malleoli; and a covering for the osseous surfaces is provided chiefly from the cap of the heel after the os calcis is dissected out of its place. After the wounds have healed the thick integument and cushion of the heel form a comfortable and elastic stump to walk on, and the leg is not much too short for successful locomotion. The operation is usually performed to get rid of caries of the tarsal bones; and has been advised instead of Chopart's amputation, when caries calls for that operation, for the disease is often progressive, attacking the astragalus and os calcis after the removal of all the bones that were apparently affected.

Provision having been made against hemorrhage, either by the thumbs of an assistant, Esmarch's elastic apparatus, or a tourniquet, the operator puts his left hand behind the heel, with the thumb and finger resting on the places where the incisions are to commence and terminate; these being the tip of the external malleolus, and a point just opposite, on the inside of the foot, and an inch below the internal malleolus, posterior to its centre. He now makes an incision from one of these points to the other, across the front of the ankle; he then makes the second incision at right angles with the first, the knife cutting from one end of the primitive wound, through the sole of the foot, to the other extremity of the first incision. This cut may incline backwards a little in a patient with an elongated heel, and it should go clear to the bone. He next dissects up the posterior flap from the os calcis, keeping the knife close to the bone, till the point of the calcaneum is passed, when he proceeds to open the joint in front, and divides the lateral ligaments with a stroke of the knife applied between the malleolus and astragalus, completing the removal of the foot by severing the tendo-Achillis. The flaps and soft tissues are to be dissected upwards with care, keeping close to the bones to avoid wounding the posterior tibial artery; and as soon as the malleoli and the lower end of the tibia are fairly exposed, the saw is employed to remove the malleoli and a thin slice—the articular surface—of the tibia. The arteries are next to be tied, and the flaps adjusted and joined with sutures. A long strip of adhesive plaster an inch wide should be applied to the posterior aspect of the leg and brought across the stump, to the integument of the shin; and another strip of similar length and width extends from one side of the leg to the other, crossing the other strip at the apex of the stump. This holds the cap of the heel-flap steadily against the ends of the bones, thus preventing a pouch to hold a pool of pus and other fluids.

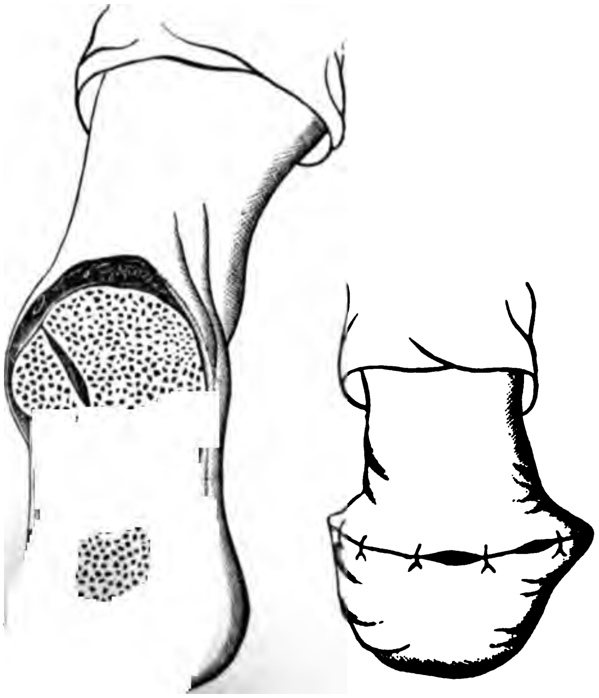
Two precautions may be properly enforced in regard to the best manner of making the incisions in Syme's amputation; the point of junction for the two incisions on the inside of the foot should be about an inch below the internal malleolus, and a little posterior to a line dropped from its centre, or the flaps will be too long, and not join evenly; the second precaution is to make the incision through the sole a little behind a vertical line, or great trouble will be encountered in turning back the thick integument over the prominence of the os calcis. Care should also be exercised that the flap is not punctured in the dissecting process.

Mr. Syme and several European surgeons extol this operation, stating that their patients move about with the greatest ease, even being able to "dance the Highland fling," yet it has never been a favorite amputation in America. In the first place, the stump does not retain a boot or shoe, and guide it well if it be retained by lacing above the calf of the limb; and, secondly, the diminished length of the leg demands compensation in a higher heel or other substitute. It may do well for those who are unable to obtain an artificial leg, but there are few patients of that kind among us.

PIROGOFF'S AMPUTATION.

The operation of Pirogoff makes a longer stump than the amputation of Syme; and has the peculiarity of being osteoplastic, a part of the os calcis being joined to the tibia. It has the disadvantage of presenting to the ground the thin integument of the back part of the heel, instead of the thick cushion

FIG. 120.



Pirogoff's amputation.

of the under part, as in Syme's operation. The amputation is performed as follows: An incision is carried across the sole of the foot from one malleolus to the other, its course inclining a little forward, instead of backwards as in Syme's operation; the second incision extends from the extremities of the first across the front of the ankle, and the astragalus is disarticulated from the malleoli by cutting the lateral ligaments and depressing the foot. A saw is then applied to the upper surface of the os calcis at a point just behind the astragalus, and a section of the calcaneum is effected by sawing downwards and well forwards. The removal of the foot is thus rendered complete, except the heel and the posterior end of the os calcis. As in Syme's operation, the soft tissues of the ankle are dissected upwards, and a saw separates the malleoli and a thin slice of the lower end of the tibia. The arteries are then tied, and the sawn osseous surfaces of the os calcis and tibia are brought into snug apposition by the use of silver sutures placed near together in the tegumentary borders of the flaps. Adhesive strips an inch wide and a foot long may also be employed, as in the dressing advised in Syme's operation. The lesion is similar to compound fracture, and is as liable to be followed by a good recovery as that injury. It is difficult to attach an artificial foot to such a stump; yet the patient can wear a leather covering shaped like a boot-leg, with a heel-piece connected to it.

AMPUTATION OF THE LEG.

Amputation of the leg a short distance above the ankle, is a common operation; and is performed generally by making an oval flap of integument in front, and a longer flap of considerable thickness behind, and then dissecting up and retracting the flaps an inch or so, to get material to cover the ends of the bones. After the bones are uncovered to a point as high as a section of the osseous structure is to be made, the saw is used upon the tibia until a groove is made, when the fibula may be included in the sawing process, and divided a little before the tibia is separated. The arteries are then tied, the flaps stitched together, and the stump dressed in the usual way. If no untoward complication arises during the healing process, the limb will be ready for an artificial leg in two months from the amputation.

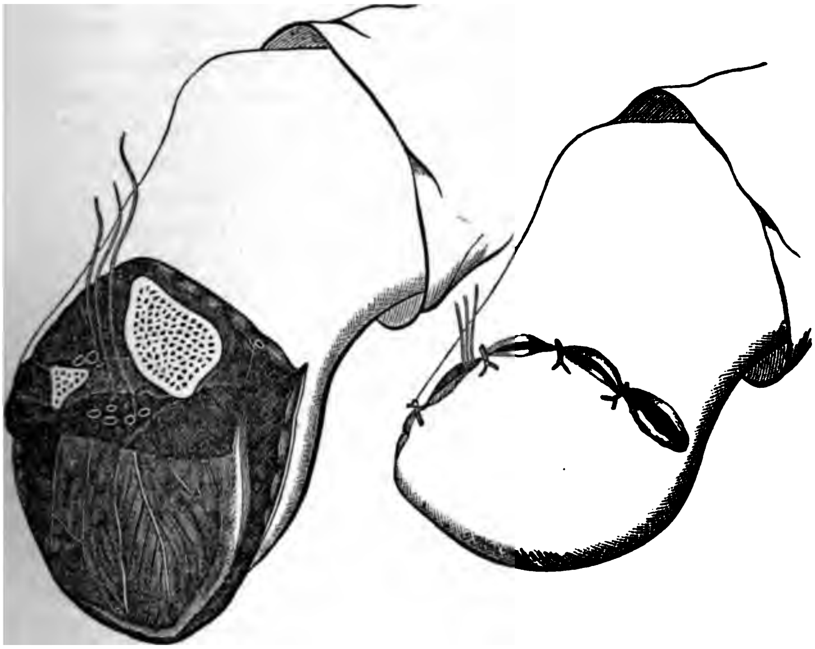
The circular method of removal operates well in the lower part of the leg. After the circulation is controlled by compression of the femoral artery, the operator makes a circular sweep of the leg as low down as possible, cutting through integument, fascia, tendons, and such other soft structures as come in the way of the amputating knife, everything being cut to the bones. A scalpel is now employed to dissect up the tissues and clear the bones an inch or more above the tegumentary incision. A cloth retractor with theee tails in one end—the middle tail going between the bones—is made to draw up and cover the flesh while the saw removes the bones. Spicula are to be removed with bone-nippers, arteries are to be tied, and then the anterior and posterior edges of the covering are to be drawn together with sutures and adhesive strips, a space being left for the ligatures to hang out of the wound. The projecting angles of the covering may appear too prominent for a handsome stump, yet by the time the healing process is complete, the cicatrix will draw the parts into a semilunar pucker which is quite shapely.

While the flap operation will continue to be oftenest performed, as good results can be obtained by the circular method. Sometimes the process should be varied so as to conform to the lacerated integument that can be utilized for a covering to the bones.

In performing an amputation of the leg the operator is to select positions that seem best, all the surroundings being taken into consideration. If the patient be on a table or lounge which stands in the middle of the room, the operator can swing the limb to be operated on away from the other, and he can stand or sit between the leg and the table or lounge. But I have had to amputate in small rooms crowded with furniture, with the patient on a bed, and the limb farthest from me to be operated upon. Although such circumstances and surroundings are somewhat vexatious, the surgeon is not to be embarrassed by them.

Amputation through the middle of the leg is usually performed as follows: After the femoral artery is compressed, the surgeon puts his finger on the fibula at a point where a section of the bones is to take place, and with an amputating knife he commences an incision and makes a sweep across the front of the leg to the inside of the tibia, the course of the knife being in the segment of a circle and bent downwards; the knife now transfixes the leg behind the bones, entering where the first incision ended, and emerging where it commenced, and is made to cut downwards for two inches and a half, and then abruptly outwards to form the posterior flap. The front flap of skin, fat, fascia, and cellular tissue, is to be dissected up to the angles of the wounds, the muscles and interosseous membrane are to be divided, and the bones cleaned for the saw. A retractor is useful to draw up and protect the flaps while a section of the bones is made. The saw-cut is begun on the tibia, and after being well started, the fibula is reached and divided before complete separation of the tibia is effected. An assistant so holds and poises the leg that the blade of the saw shall not be impinged upon, nor the bones splintered by depressing the limb too much. Prominent spicula of bone are to be removed with bone-nippers, but the rough edges the saw has left are not to be trimmed lest the periosteum be disturbed, and exfoliation favored. The vital forces will round the ends of the bones and prevent them from irritating their covering. The arteries, of which there will be two at least, are sought and tied, the flaps stitched together, and adhesive strips applied across the wound to hold the stump steady. The first suture, of silver or silk, should be placed at the middle of the flaps, then one on each side of the first near

FIG. 121.



Amputation of the leg; the covering for the bones consists chiefly of a posterior flap.

the centre of each lateral space, and afterwards a suture in each of the intervening spaces, so that the stitches shall be about half an inch apart. The ligatures hang out of one of these spaces. A double fold of soft cloth, large enough to wrap the stump and leg for six inches above the wound, is used as a covering; and this is held in place by two or three fillets tied around the middle of the wrapping, or by a few turns of a bandage. The limb thus lightly dressed, is finally laid on a pillow or cushion. If the patient suffer intense pain after recovering from the effects of the anæsthetic, an anodyne is to be administered. The surroundings are to be made as comfortable as practicable; and the patient is to enter upon a dietetic course suited to his condition. For a few days, while the irritation is considerable, and traumatic fever is present, gruels, toast and tea, and light articles of diet are to be employed; but in the course of six or eight days, broths, soups, steaks, and other relishing and supporting kinds of food should be freely served.

Amputation at "the place of election," according to old surgical authorities, is at a point a few inches below the knee, and may be performed according to methods just described. Before the invention of modern artificial legs, a "peg-leg" was almost the invariable substitute for the lost limb; and to work well it required a short stump below the knee; and this stump was flexed or turned back, so that a bearing was taken just below the knee, on the front aspect of the tibia. A mortice was made in the upper end of the peg-leg for a socket, and the sides extended above the knee and were fastened to the thigh for support. Such a substitute is quite useful, but awkward. The American surgeon pays no attention to the old "place of election," but saves as much of the limb as he can for the control of a modern artificial leg.

Amputation at the knee-joint was once a favorite operation, but is now performed only when circumstances favor the place. Two objections raised against the procedure, viz.: 1st, that a wound would not heal readily over so much articular structure, has not proved valid; 2d, that an artificial leg could not be adjusted to such a stump and worn with ease, has not been sustained by experience.

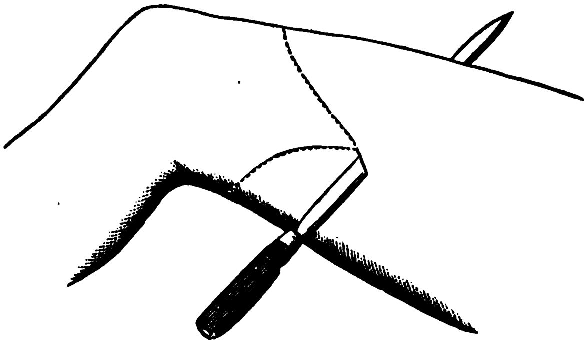
When from injury or disease the tibia must be sacrificed by amputation, yet a sound thigh can be retained, and healthy flaps from the upper extremity of the leg, amputation at the knee-joint is practicable; and the operation may be performed as follows: After the patient is anæsthetized and the femoral artery compressed, the hollow of the hand may be laid on the patella, the thumb and little finger on each side of the articulation, to indicate where the anterior incision is to begin and end; the end of the middle finger extended upon the tibia also marks the point where the lowest part of the semicircular sweep is to reach when the incision is made. The cut having been made through the skin and subcutaneous tissue, the flap is to be dissected up to the articulation, the joint opened and the lateral ligaments divided, as well as the crucial, and other structures which oppose a slight removal of the articular surfaces of the tibia from the femur. An amputating knife is now placed behind the head of the tibia and a posterior flap made by cutting downwards about two inches and a half, and then abruptly backwards to complete the flap. The amputation is thus easily performed with the knife alone; the patella is left in the anterior flap, and rests between the condyles of the femur. The popliteal artery needs ligating, and possibly some articular branches. The edges of the flaps are then joined by sutures and adhesive strips, as in other amputations, and the dressing is to be substantially the same. The danger to life is about the same in this amputation, as in division of the limb through the lower extremity of the thigh, and the period of the healing process is about the same. There is nothing especially to commend the operation, and little can be said against it. It has been claimed by its champions that there is less danger from exfoliation of the bone when simple disarticulation takes place; and that bleeding from the medullary structures is obviated, but these advantages, if they be such, are counter-balanced by the greater shock in an operation involving joint-structures, and a tendency to higher grades of inflammation.

Amputation of the thigh, as of the arm, may be executed by the flap or circular method of dividing the soft structures. There is no place of "election," but as much of the limb as possible is preserved. If an inch of bone can be saved by having the flaps extend a little below the knee and by separating the femur through the condyles, the duty of the surgeon is plain; he is not to go higher because it is a little more convenient to do so.

The circular method may be performed as follows: After the femoral artery is compressed with an elastic apparatus, a tourniquet, or the thumbs of an assistant, the operator makes a circular sweep of the amputating knife, cutting skin and subcutaneous tissue as near the knee as practicable. The integument is drawn upwards before the incision is made, consequently there will be a saving of material to cover the bone, yet it must be pulled upwards still more before the muscles are divided by the second circular sweep of the knife; and after the flesh is divided to the bone the soft structures are to be forced upwards with a retractor, to secure an abundance of covering. In the lower part of the thigh, especially in young subjects, the long muscles exert a great deal of retraction, therefore a liberal provision should be made for covering the end of the bone. While it is disadvantageous to have too much covering, too little may require opening of the stump in order to saw off a piece of the femur. The muscles on the lower or posterior aspect of the leg are the largest, consequently the greatest contraction on that side may be looked for. The artery having been tied, the anterior and posterior borders of the wound are to be drawn together with sutures, a central stitch being introduced first, then one in each lateral half, and these are succeeded by sutures in the intervening spaces, till the fastenings are three-quarters of an inch apart. Adhesive strips are next applied between the sutures, the pieces being long enough to afford support to the sliding, fleshy stump. Of course the ligature hangs out of the wound at a place corresponding with its attachment to the artery. During the healing process the angles of the wound, which projected in an unsightly manner at first, will disappear through absorption and the contraction of cicatrization. If the end of the bone be simply covered, without strain, there will be no subsequent trouble, but if it project, and have a thin scaly layer on its end, the covering is scanty, and may prove annoying.

The flap operation is the easiest and often the best method for amputating the thigh. The circulation being controlled by compression of the femoral artery, the operator may stand on either side of the limb, as circumstances favor, and having grasped the skin and muscles on the upper or anterior portion of the thigh, and elevated them, he sends the amputating knife through the limb from side to side, yet in front of the bone, and by a sawing motion cuts downwards and towards the integument, making a wedge-shaped flap three inches in length. The knife is then entered again where it went in first, and transfixes the mb behind the bone, when the posterior flap is made a little nger than the anterior. The artery, which is in the posterior p low down in the thigh, is now tied, the flesh retracted with firm piece of cloth, and the bone divided with a saw, an assistant pporting the limb while the section is made. Before closing e wound with sutures and dressing the stump, it is well to wait few minutes, to see if arterial twigs do not develop dangerous undue hemorrhage. At length, everything appearing well, e edges of the flaps, embracing little more than integument, are nited with sutures, a central stitch being employed first, then e in the middle of each side, and so on till the spaces between

FIG. 122.



Flap amputation of the thigh.

ures are not more than three-quarters of an inch in extent. e ligature is left to hang out at its proper place. A double d of soft muslin, fifteen inches in width and eighteen inches in ngth, is wrapped over the end of the stump, and then held in ace with one or more ties which may be strips of bandage irty inches long. The stump is then laid on a pillow or cushion hich gives it sufficient elevation. The wound may be dressed very day, but the adhesive strips should not be removed for ight or ten days, if they do not become too tight through swell-ng of the stump, or unclean from contact with foul fluids. The tures may be snipped and removed on the fifth or sixth days, by that time they begin to provoke ulcerative action. The gatures will come away in a few more days, especially if gently lled upon occasionally. The wound heals mostly by the first tention, yet in places suppurative action and granulation will kept up for three or four weeks. In three months from the time of amputation the stump may endure the pressure of an artificial limb, though more time is commonly taken, the patient getting about for awhile on crutches.

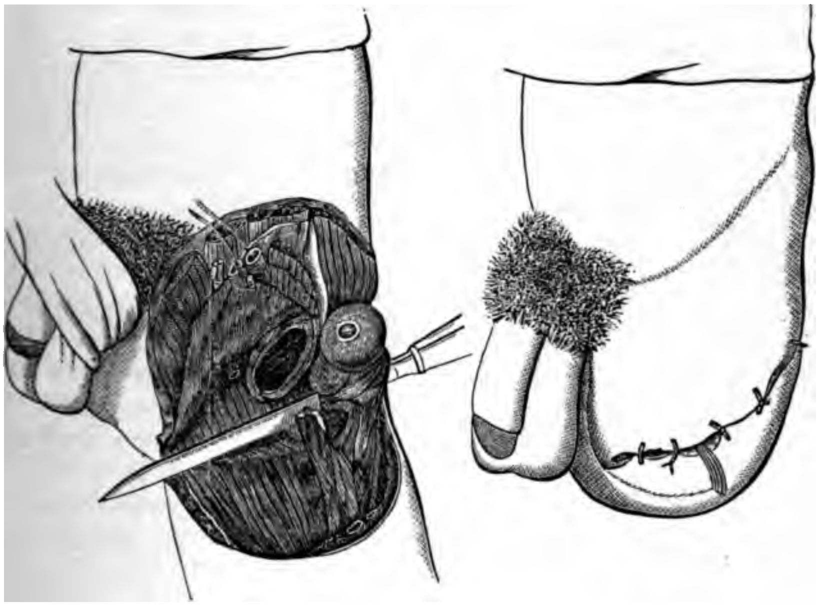
Amputations near the middle of the thigh are to be conducted like those just described, but when the upper third is reached the flaps may be made from the inside and outside of the limb, a horse-shoe tourniquet being used, or compression of the artery under Poupart's ligament being made by the thumbs of a good assistant. In such a case the inside flap should be cut first, the artery receiving a ligature as soon as the flap is made, to guard against hemorrhage which might arise through accidents. The outer flap can then be made, the bone sawed, and the dressing applied as in other amputations. If the operator prefer the anterior and posterior flaps, the front should be made first, and the artery tied as soon as the flap is cut. Two or three arterial branches of considerable size may need ligating. Flaps three or four inches in length will cover the bone.

Amputation below the greater trochanter, yet through the lesser, is preferable to disarticulation at the hip-joint. An assistant secures the artery with his thumbs, while the operator makes the anterior flap and ties the vessel. The remainder of the operation can be conducted with security and deliberation. The blade of the amputating knife should be long enough to allow a sawing motion while making the flaps. It is embarrassing to amputate with a knife too short. There is some trouble in sawing the bone so near the body, but it can be done if the operator has the flaps well retracted, and he works without haste.

Amputation at the hip-joint is a formidable operation, yet not the most difficult of surgical undertakings. It is dangerous on account of the extent of the traumatism, the amount of deprivation the body undergoes, and the effects of the disease or injury which necessitate the operation. The causes which lead to amputation at the hip-joint are comminuted fracture, necrosis, caries, osteo-sarcoma, gangrene, and incurable degeneration of the femur, yet with soundness of the cotyloid cavity and bones of the pelvis.

The generally accepted method for amputating at the hip-joint, is, after the femoral artery is compressed by the thumbs of a reliable person, to enter the knife—a long one—at a place corresponding with the centre of the greater trochanter, then carrying it through the limb so the point shall cut the capsular ligament of the joint as it passes, and make it emerge on the inside of the thigh, the genitals being held away or protected, when the anterior flap may be made with ease. The femoral artery should be ligated as soon as the flap is made. The disarticulation can not be executed unless the patient's hip rest on a table near its edge, for the limb has to be depressed while the ligaments are incised and the greater trochanter is cut free of muscular and tendonous attachments. A strong scalpel is a good instrument to use in this part of the operation. As soon as these obstacles are overcome with the edge of the knife, depressing the limb forces the head of the bone out of the socket. The ligamentum teres may then be divided, and the amputating knife placed behind the bone, where it is to make the posterior flap, which may be short, as there is no projecting bone to cover. Large arterial trunks will have to be tied in the posterior flap at once to save the loss of too much blood. The flaps may now be left to drain a few minutes, then their edges may be approximated with sutures and adhesive strips; a sand-bag rests against the gluteal structures. Such an extensive wound suppurates pro-

FIG. 123.



Amputation at the hip-joint.

fusely, yet if ample drainage be allowed, serious harm may not ensue from that source.

The patient is in danger from shock, hemorrhage, exhaustive discharges, visceral complications, and the extension of the disease that called for the amputation. The deaths in some cases have been quite unexpected, and without well defined causes, while in some instances of recovery there has not seemed to be a basis for rational hope or expectation.

Instead of trusting to an assistant who may not be competent to compress the femoral artery under Poupart's ligament, it is safer to have a horse-shoe compressor with long arms which may be made to arrest the circulation in the abdominal aorta. One pad, broad and well upholstered, rests on the back, while the other is placed a little above and to the left of the umbilicus; then a few turns of the screw will arrest pulsations in both femoral arteries. The pressure of the pad on the abdomen produces no unpleasant consequences, and is readily graduated by turns of the screw. The instrument cuts off all blood going through the internal iliacs and their branches, therefore there is no bleeding from vessels in the posterior flaps until the blood is let on by reversing the screw after the amputation is over, and the operator has time to attend to the ligation of arteries that bleed.

Amputations have occasionally been regarded as the opprobium of the healing art; and justly, too, if they are performed regardless of other measures that might result in cures, though the recuperative process be too tedious for the impatient surgeon. But the outcry against surgical operations generally comes from those who are too timid or incompetent to execute an operation when the life and health of a patient hinge upon it. A great number of patients lose their lives annually through the ignorance and prejudice of medical advisers who hold cases in their hands until surgical interference, which might have been serviceable earlier, is no longer practicable.

SECTION XI.

REGIONAL SURGERY.

WOUNDS OF THE SCALP.

INCISED and lacerated wounds of the scalp are somewhat different from similar traumatic conditions in other parts of the body, from the fact that the hair becomes matted in the wound, pus burrows and festers out of sight, pyæmia occurs, as manifested by swelling and soreness of the lymphatic glands of the neck, and the systemic febrile state. An injury of the scalp inflicted with a cane or bludgeon, or by a fall against the sharp edge of a rock, or other hard substance, presents the features of a clean cut, though it proves more serious in its nature.

Scalp wounds are to be treated with circumspection. The hemorrhage is generally unimportant, unless the temporal or occipital arteries be divided; and even then they are easily compressed until the flow ceases. The hair is to be snipped short for some distance around the wound, in order that the lesion may be watched and dressed. Foreign bodies are to be looked for, and carefully removed when found. The finger is the best explorer to be used in the examination of a scalp-wound, for it feels extraneous substances, and detects fractures of the skull if any exist. When a wound of the scalp is made clean, its borders may be brought together, and held in contact with silver sutures if they will not stay in place without artificial assistance. Adhesive strips will not do much good unless the scalp be shaved with a razor. A solution of salicylic acid and borax should be applied to the wound every few hours to prevent the development of ferments. Diffuse cellular inflammation of the scalp first shows itself by slight puffiness, and is attended with rigors and feverishness. When such symptoms exist the sutures should be removed, that exit may be given to effused fluids, and that antiseptic remedies may be freely applied. Quinine and mineral acids are to be administered internally, and every precaution employed to prevent and subdue brain symptoms. If fluids are effused beneath the scalp, occipito-frontalis muscle, or pericranium, it may be judicious to make incisions at points where they exist, to set them free.

Inflammation may, from a contusion of the scalp, reach the diploic structure, and result in thickening of the skull, caries, necrosis, and meningeal or cerebral complications. A wound of the scalp may seemingly do well for a week, and the patient be discharged, when all at once, without noticeable warning, a rigor may set in and the most serious consequences follow. In such cases there is either purulent infection or the development of pus inside the skull; and in either case the danger is very great. If there be no marked indication for the use of the trephine to evacuate pus, and a sign of that character is seldom present, reliance must be placed upon warm topical applications, and the internal employment of iron, mineral acids, and quinia. In the event of great heat in the head cold applications may be tried.

Extravasation of blood beneath the scalp, the result of contused wounds, is a common occurrence, and generally easy of diagnosis. When the raised welt or tumor has a hard ridge round its base, and a soft and depressed centre, it has been mistaken for fracture of the skull with depression of a fragment of bone. The lymph caused by extravasation may be incised to let out the blood, but in many instances the clots are decomposed and removed by absorption, and no bad effects attend or follow the process.

SCALPING.

On the eighth of June, 1849, in a spinning mill at Anderson, England, a girl fourteen years of age, by the name of Jane Jones, suffered the loss of her scalp in the following manner. The case was reported by Mr. Fleming who had the surgical management of the patient; he says: "While engaged in brushing beneath the inner end of a mule frame, in a kind of half sleepy state, she inadvertently allowed her hair to come in contact with a small revolving horizontal shaft, which, in pulling round the hair, carried along with it about thirty-five square inches of the scalp, leaving the upper, front, back, and lateral parts of the skull completely exposed to that extent, the thin transparent covering of the pericranium being all that was left. On reaching the mill, I found her in a weakly, half faintish state, sitting upon a chair, supported by her friends. She had lost but little blood, but the left temporal artery soon began to bleed so freely as to require a ligature. The wound was dressed with the common adhesive plaster, covered with a cloth moistened with cold water, and the patient removed home to her bed, where she spent the first day and night in a much more comfortable state than could have been expected under the circumstances. On the second day I found her in a remarkably comfortable state compared to what I expected to find, and was not a little surprised at her informing me that, at the time of the accident, she did not experience the slightest pain, nor was she in the least aware of her misfortune, until she applied her hand to her head!"

The wound began to granulate on the third day, and on the seventh of August, two months after the accident, only seven square inches, or only one fifth of the original wound, lacked tegumentary covering. At the time the report was made a complete recovery was highly probable.

In August, 1871, a girl at work in the watch factory at Elgin, Illinois, accidentally got her hair entangled in moving machinery, and she lost the entire scalp, the denudation extending from the back of the neck to the eyelids, and from one ear to the other. The case fell into the hands of Dr. D. E. Burlingame, who, as soon as practicable, applied the detached scalp to its original location; but, as might be expected, it soon became a putrid mass and fell off. The pericranium was not, as I have been informed, torn from the skull with the scalp. The wound speedily became covered with masses of granulations, and to these Dr. Burlingame applied skin grafts from time to time, repeated attacks of erysipelas sweeping away the growing integument.

When the granulations were soft, spongy, exuberant, or unhealthy, the doctor touched their surface with nitrate of silver, and the agent seemed to improve the reparative condition. The patient at times lost considerable blood—usually venous, occasionally arterial. Pressure of the finger on the bleeding point seemed to check the hemorrhage.

Dr. Burlingame operated upon one eyelid which had been drawn up by the contraction of cicatricial tissue.

About the time the scalping accident happened in Illinois, another of a similar character occured in Massachusetts; and the following report of it is taken from the *Boston Medical and Surgical Journal*, for July, 1872. The reporter is Dr. Theo. F. Breck, of Springfield; he says: "August 15th, 1871, Miss E. W., aged 21, an employe of a Springfield Manufacturing Company, while reaching to take something from a shelf above her head, caught the net covering her hair, and her hair also, on a revolving shaft two inches in diameter which was making 128 revolutions in a minute. Her entire scalp was torn off, with the subjacent and other tissues, down to the *pericranium*, from the fifth cervical vertebra posteriorly, and laterally from ear to ear, including the skin of both eyelids and a piece of skin two inches square from the left cheek.

"I reached the factory some thirty minutes after the accident, and found the patient sitting on the floor, with her hands clasped round her knees, and apparently very calm and collected. There was very little hemorrhage; her pulse 80, about normal, and her respiration regular and not rapid. She was immediately carried to her home, and the wound dressed with a weak solution of carbolic acid. No attempt was made to replace the scalp, as it was torn into shapeless fragments.

"During the next twenty-four hours she was given milk and stimulants freely, and morphia sulph. gr. ⅛, every three hours.

"Aug. 16th, patient very comfortable; complains of no pain. Pulse 80, full and regular. Treatment continued.

"Aug. 17th, there has been considerable hemorrhage the past twelve hours, which, upon removing the dressings, was found to come from the supra-orbital artery. It was checked by pressure, and the application of ferri persulph. Patient somewhat excited. Pulse 110.

"Aug. 18th, passed a comfortable night, and is much refreshed. Pulse 105, strong.

"Aug. 19th, upon removing the dressing, suppuration was found to have begun, and the wound was dressed with ungt. creasoti. Bowels freely moved by enema. Opiate discontinued. During the next two weeks the patient's condition steadily improved. She then had severe inflammation of the left eye, resulting in its destruction. The origin of this trouble was a fragment of pencil which she had behind her ear at the time of the accident.

"It is now nine months since the accident, and the process of restoration has been very slow. At times the skin forms very rapidly, then what has already formed will slough off, leaving the whole wound an ulcerating surface.

"Various applications have been made, but with little benefit. The patient's health is excellent, she being able to go about and attend to the various duties of life. The question is, will skin ever form over the entire surface of the wound?

"About the time of this accident, several cases very similar occurred. One in particular, at the Elgin (Ill.) watch factory. I should judge from the description which I received from the attending surgeon, that it was identical with the present case. There the scalp was replaced, but with no success, as it sloughed off on the fourth or fifth day.

"I have advised the patient to submit to Reverdin's operations of skin transplantation, but she is very unwilling to allow any surgical interference."

October 6th, 1875, at Remington station, on the Marietta railway, Carrie Dawson, 19 years of age, an employe in a paper mill, lost her entire scalp in the following manner: She was standing near a revolving upright shaft, when her hair, which was flowing loose, was caught, and in an instant entwined to the head. A stationary obstacle prevented the body of the victim from being carried around as the cylinder revolved; and the hair proved stronger than the attachment of the integument to the skull, consequently the scalp was torn from the cranium. Dr. Eckermeyer, of Montgomery, was summoned to the case, but as an hour or more had elapsed before his arrival, he did not deem it advisable to attempt to replace the cold and lifeless scalp to its former site. He found that the patient had lost considerable blood, and was still bleeding, but not profusely. No arteries needed ligating. He applied lint to the wound, and kept it wet with arnica water. The patient was not in as much pain as naturally would be expected, and slept some the first night while under the influence of an anodyne. The next day I was called to consult with the attending physician, and carefully examined the extensive traumatic surface. The laceration began in the back of the neck as low as the hair grows, and extended forward to the superciliary ridge over the left eye, and to the eyelashes of the upper lid on the right side. As the laceration extended forward the denuding process reached to the top of each ear, and as low as the zygoma on the right side of the face, probably the point where the wounding ended. The aponeurosis of the occipito-frontalis muscle had gone with the scalp, and also the pericranium, leaving a part of the occiput, a large area of the two parietals, and most of the os frontis, entirely stripped of a membranous covering. The temporal muscles remained in place, and their bright red hue formed a striking contrast with the white skull arching above.

To the surfaces of these muscles I applied several grafts taken from the scalp of a sister of the patient. This was done by shaving a spot, then excising with scissors pieces of integument the size of hemp seed, and lastly applying them as fast as removed to the lymph-covered flesh. Each graft was pressed into its bed and held there with a small piece of isinglass plaster. I took a few skin grafts from the integument of a lady's shoulder, and applied them to the remnant of the frontalis muscle just above the eyebrows. A cerate cloth was then placed over the entire wound, and upon this a handkerchief was pinned in order to maintain an equable temperature, and to afford a cushion-like shield to the tender parts. Dr. Eckermeyer redressed the wound daily, and used a solution of salicylic acid to subdue the fetor. The traumatic surface granulated rapidly and suppurated freely, except where the skull was bare. At the end of a week the exposed bone began to darken in hue, yet the granulations pushed out so fast all along the border that hope was entertained for a covering of the osseous surfaces, especially as a serrated line of new flesh appeared in the sutures of the denuded cranium. However, it was found in the course of three weeks, that the outer table of the skull was too near dead to receive the growing flesh; and that the granulations only piled up, and did not extend their boundaries—that they even receded a little from the extreme lines once reached. At the junction of the sagittal and lambdoidal sutures a mass of new flesh formed, and extended quite a distance in every direction. Small masses of granulation formed at the parietal foramina, but showed no disposition to extend. Day after day the color of the exposed bones grew darker, and more apparent it became that the outer tables would exfoliate, therefore it was decided to perforate the dying bones in order to let granulation up from the diploic structure; and in about a month from the reception of the injury, I used a hand-drill, and bored twenty-eight holes through the outer tables of the two parietal bones, and os frontis, starting blood from the vascular diploic structure at every perforation. In a few days the bones assumed a lighter color, and granulations rapidly grew from every artificial opening. These fleshy islets gradually extended until they reached each other, and covered in the osseous surfaces. Small pieces, however, that were not enveloped soon enough, exfoliated.

The vital operations in this case strikingly demonstrated that when any considerable portion of skull is deprived of all membranous covering, the outer table should he perforated with a drill in order that the vessels of the diploic structure may evolve granulations to cover the denuded bone. The perforations should not be more than half an inch apart, and the openings ought to be not less than an eighth of an inch in diameter. The thin yet dense outside lamina of the cranium will not let the growing vessel through; and this is the scale of bone which exfoliates.

Several of the tegumentary grafts first applied formed adhesions, and are extending. Epidermic scales scraped from the arm were applied to the islets of flesh as they appeared in the serrated lines of the cranial sutures, and to the granulations springing from the perforations, yet no tegumentary tissue formed from them.

In the treatment of Miss Dawson's case, there appeared but two complications that gave the patient unlooked-for distress: one came from a burrowing of pus beneath the integument of the back of the neck, and the other from a troublesome abscess that formed at the base of the left ear. The first was overcome in a few days by pressure exerted through a compress, but the second was more persistent.

The patient lost considerable flesh during the first four weeks, and occasionally exhibited signs of dangerous vital depression; but she gradually recovered her health and strength. The extensive wound at length healed, and the girl wore a wig of her own hair, which was saved and preserved.

"Scalping," a method of mutilation practiced by savages, does not necessarily prove fatal, especially if the wound be kept in a wet dressing. The denuded bone may become necrosed and exfoliate, but the wound often heals without serious consequences. A spot of denuded skull may be made to obtain a covering by boring small holes through the outer table of the cranium; from these granulations spring, and, reaching each other, form a covering to the naked bone.

FRACTURES OF THE SKULL.

Fractures of the skull may, for practical purposes, be conveniently divided into those which are confined to the vault of the cranium, and those which pertain only to the base of the skull. Fractures of the vault are produced by direct violence, the bone giving way where it is hit, a fissure or fragments being the result. Fractures of the base of the skull occasionally occur from *contre-coup*, or by indirect violence; a blow being received on the vault has its force carried downwards by the arches, until it is spent on the comparatively flat surface of the under side of the cranium, but producing a fissured fracture there. Fractures of the vault and base may occur at the same time, the vault being comminuted and the base fissured. In such cases the fracture-line is continuous from the vault to the base.

Fractures of the vault may be limited to the outer or to the inner tables of the skull, or extend through the whole thickness of the bone. The fragments, in case of comminution, may retain their proper level, or be driven inwards, resulting in depression. In the vicinity of the frontal sinus the depression may be marked, yet only the outer table be broken. Such is the resiliency of the outer table that under a severe blow it may escape fracture, while the more brittle internal table will be broken and depressed.

Fractures of both tables of the skull, with depression, are common. An oval piece of bone is not only driven down, but split longitudinally, the two fragments slanting towards each other, rendering the depression greater at the center than at the circumference. In such cases the inner table is shattered more than the outer, and the depression of one or more of the fragments is apt to be greater. Such a feature may be produced by a heavy body with a sharp or angular margin, and applied with great force. The kick of a horse, the blow of a slung-shot, a fall upon the edge of a hard body, and a thousand other ways of receiving violence upon the skull, may result in fracture and depression of the fragments.

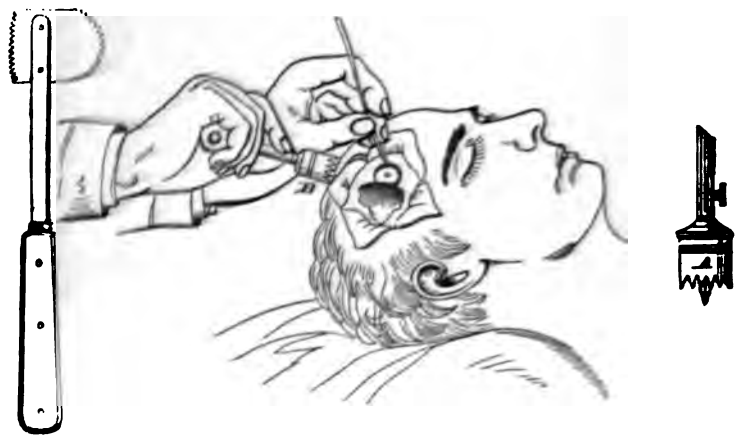
As a general rule, fractures of the skull, with a wound of the scalp which has been produced by the same violence, are easily detected, for the finger will find the fissured, irregular and depressed broken edge; but if fracture of the skull be simple in its nature, the scalp being bruised but not cut or torn, the diagnosis is not so easy. A fracture may be hidden by the temporal muscle, or by a mass of extravasated blood, so that it may not be detected until after death. Uneven places at the sutures and fontanelles, are apt to mislead while the skull is being examined for fractures.

The treatment of fractures of the skull is to be modified by circumstances. In simple linear fracture with some cerebral disturbance, it is well to trust to mild measures, though there be suspicion of depression of a fragment of the inner table. If an error is likely to be committed, it is better to be that of doing too little than that of doing too much. In a simple fracture, with depression unmistakable, if no brain disturbance be observable, the case is to be let alone until cerebral symptoms warrant heroic measures. A patient with a simple or compound fracture of the skull, with no signs of depression or disorder, is not, however, to be told the danger is trifling, and that he can indulge at once in a course of life that is attended with exertion or excitement. While the recuperative action is progressing finely, hemorrhage may take place, or inflammation arise, so that the outlook of the case is changed for the worse when nothing untoward was expected.

In cases of compound fracture and depression, though there be no cerebral disorder, it is well to clear the wound and remove the depressed and distorted fragments, for if left in the places they have been driven, they are sources of irritation and suppuration. The operation is not for present relief, but for impending mischief. A punctured fracture, or such a one as is made with the point of an instrument, is exceedingly dangerous. The outer table may not be the source of anxiety, but the inner table is generally splintered, and the sharp edges of the fragments lacerate the dura mater, or provoke inflammation and suppuration. The blow of an ax or hatchet may seemingly make a linear cut or fissure in the outer table of the skull, yet splinter and depress quite extensive fragments of the inner table; hence such fractures are always dangerous. There is often great difficulty in ascertaining the exact condition of the inner table; but if a probe, introduced through the crevice, can be carried sideways and to considerable depth before reaching the inner table, splintering and depression are quite manifest.

In severe cases, or those in which there accompanies compression the most decided brain symptoms, it is the duty of the surgeon to operate, though there be a strong probability that all his efforts will prove unavailing. In such injuries the cerebral disturbance does not wholly depend upon the pressure the fragments of bone impart, but upon extravasations of blood, and lesions of the brain substance. Removal or elevation of the fragments affords all the relief art can effect. Children survive compression much better than adults, consequently an operation may be postponed in childhood which would be peremptory in middle life.

FIG. 124.



The trephine making ready for the use of the elevator. The operator is testing the depth of the saw-cut. At the right of the picture is seen the crown of the trephine with the center-pin projecting; at the left is a representation of Hey's saw.

In operating the object is to elevate or to remove the depressed fragments; and this can often be done with an elevator and strong forceps, no trephine being required. The removal of a projecting ledge of bone with Hey's saw may enable the operator to use the elevator. As soon as one piece is loosened, the others may usually be elevated or disengaged with ease. When no crevices, edges, or corners, can be reached with the elevator, the trephine offers the only means of introducing a lever to pry the fragments up, or to displace them. The trephine is a circular saw, having a handle to work it, and a center-pin to keep the saw in place until a groove is made deep enough to hold it in position. The center-pin is then to be set above the saw, lest it injure the dura mater before the disc of bone is removed. The instrument is not to be used until a sound portion of bone adjacent to the fracture is bared of scalp to an extent that will admit the center-pin to rest upon it. A complete disc is rarely removed, for as little bone as possible is taken away. When the spot is selected and prepared for the trephine, the center-pin is set about an eighth of an inch in advance of the crown or teeth of the saw. After it has made an aperture, and the saw has formed a groove which will keep it in place, the center-pin is to be loosened with the screw which holds it where placed, and having been raised, is secured there. The sawing is accomplished by partial rotations of the trephine backward and forward, with a light hand. When the saw-teeth seem to be clogged with cuttings, a brush, which belongs to a trephining set of instruments, is used to clear the teeth; and a quill tooth-pick may be employed to measure the depth of the saw-cut from time to time, in order to ascertain when the trephine has begun to cut through the skull. The last movements of the saw are made with care, lest the teeth of the instrument lacerate the dura mater. As soon as the saw has cut through in one place, it should be inclined to the opposite side that the bone may be cut evenly. When the disc can be moved a little, the elevator may be used to break any uncut splinter. As soon as the disc is removed the membranes at the bottom of the pit may be seen. The elevator is then employed to raise depressed fragments. If pieces of bone are so far detached that they have no reasonable chance to retain vitality aud become consolidated with the adjacent sound bone, it is best to remove them altogether. But in the removal great care must be exercised, or unnecessary injury will be inflicted upon the cerebral meninges, and even upon the brain itself. I find a pair of strong forceps of great use in the removal of fragments held fast by interlocking. After the fragments have been elevated or removed, and clots of blood displaced, the flaps of scalp are to be replaced, but not held in contact with sutures. A piece of wet lint is to be placed on the wound, yet not bound there so that discharges may not find ready escape.

It was the custom in former times, to place a plate of silver in the opening made with a trephine, with the object of protecting the brain from external influences, but the practice was long since abandoned. Thickened dura mater, organized lymph, and the scalp, are now allowed to fill the chasm and protect the delicate structures beneath. In the event that a large piece of skull is removed, a dense membrane forms from one border of the chasm to the other, and serves as a protection against external violence. I once saw a lad who lost the larger part of the left parietal bone from the fall of a tree. He recovered, and a membrane like parchment covered that part of the brain which had been deprived of an osseous protection. By pressing upon the membrane hard enough to indent it, profound sleepy sensations would be produced; and in a few minutes after the pressure was removed the boy would wake up and be as lively as ever.

Fractures of the base of the skull may be direct, arising from thrust-wounds with a scissors-blade or other penetrating iustrument. Fractures produced by puncturing forces are generally effected through the orbital walls or nasal cavities. The condyle of the under jaw may be forced through the articular fossa of the temporal bone, and do irreparable mischief. A chill or rigor comes on, brain symptoms appear, and the patient dies of coma or convulsions. In such cases it is difficult to determine whether the fatal termination comes from blood-poisoning, thrombus in the veins or sinuses, meningitis, or abscess of the brain. As several of these morbid states may exist at the same time, death could come from a complication of difficulties. The fact that punctured lesions of the skull leave no opportunity for drainage, is enough to account for an unfavorable issue. What are called indirect fractures of the base of the skull, do not arise from *contre-coup* as often as has generally been supposed, but a crack or fissure may run from the point hit on the vault, to the base of the skull, and there manifest the most prominent features of fracture. A person falling from a great height, and striking upon the feet, may have the force transmitted upward to the base of the skull, and there produce a fracture. The forcible impulsion of the spine against the petrous bone may result in fracture. Experiments upon a large number of cadavers proved that the *contre-coup* seldom or never broke the base of the skull, whether the bodies were precipitated upon their heads, or a hammer was used to pound the vault. If a person were to fall from a height, and, striking on the top of the head, should sustain a fracture of the base of the skull, there would be no certainty that the *contre-coup* did the mischief; but the heavy impact of the body through the intermedium of the spinal column, may have caused the fracture.

The symptoms indicative of fracture of the base of the skull, are cerebral disturbance, and the discharge of blood, serum, and brain into the throat, nose, and ears. When the walls of the orbit are broken extravasated blood makes its way forward and shows itself through the conjunctiva and integument of the lids. Bleeding from the ears is one of the most reliable signs of fracture of the base of the skull, yet the lack of this sign is not to taken as evidence that no fracture exists. If the petrous bone be broken, and the membrana tympani be lacerated, blood readily finds its way out through the meatus externus.

Discoloration of the skin in the mastoid or cervical regions is a pretty good sign that a fracture of the base of the skull exists. The blood oozing from the fractured skull gradually infiltrates the cellular tissue, and ultimately reaches the skin, producing ecchymosis. A sudden puffiness in the occipital region, with discoloration of the skin coming on a few hours afterwards, may be considered diagnostic of fracture of the base of the skull. The watery discharge from the ears after fracture of the base of the skull, is presumed to be the cerebro-spinal fluid, the meninges having been lacerated. However, cases are reported on good authority, in which there was copious watery discharge from the ear for several days, or until the patients died, and a post mortem examination revealed no fracture of any part of the tympanum, and no rupture of the membrana tympani, so that the fluid could not have been cerebro-spinal.

There is no special plan to be adopted in the treatment of fractures of the base of the skull. The trephine can be used in some instances, care being taken not to open the large venous sinuses in the posterior region of the cranium. If a fracture be compound, a finger in the wound will decide whether much can be done to relieve the symptoms of compression. The trephine has been used close to the foramen magnum. Patients with fracture of the base of the skull are in a critical condition for two weeks, whether brain symptoms appear or not. A profuse watery discharge from the ear may be one of the ways nature has to relieve congestion of the head. At any rate, patients with such discharges frequently recover.

CONCUSSION OF THE BRAIN.

When a man receives a heavy blow upon the head, and falling insensible, continues thus for a few minutes, or several hours, or even days, and then recovers all his faculties, and becomes sound and well as if nothing had happened, he is said to have labored under concussion of the brain. Again, if a man receive a blow upon the head, and insensibility arise and continue several hours or days, and death occur, yet an autopsy reveal no lesion of the brain, what is the cause of death? "Concussion of the brain."

It will be seen, then, that insensibility produced by blows applied to the head, without fracture of the skull or compression of the brain, is denominated CONCUSSION. It has been suggested that in a simple case of stunning a change takes place in the ultimate molecules of the brain-substance, without the modification being appreciable, as when a measure of grain is kicked, and a change in the relationship of every kernel occurs, yet with no observable modification. While this may do for a suggestive illustration, it gives no clear idea of the injury sustained in concussion of the brain. In most instances of severe stunning there is extravasation of blood in the meninges or brain-substance. The shock produces the insensibility, and congestion and extravasation keep it up. When the insensibility passes off in a few minutes the injury chiefly consisted in "shock;" but if it continues for hours or days, there was something more than shock—there must have been congestion and probably extravasation. If a patient die after receiving a blow on the head, yet the death occur from other injuries, the veins and capillaries in the vicinity of the head-injury exhibit a fullness that is readily observable. Patients dying a few days after a severe blow upon the head, show marked congestion of the inter-cranial structures, and not unfrequently extravasation. When the brain is sliced the surfaces exhibit more and larger red specks than the normal brain; and extravasated blood, though not in quantities to produce compression, is often found.

It was once customary to draw distinctions between the symptoms of concussion of the brain and those of compression, as if they always existed, and were never blended or confounded; but we are now persuaded that there is no one symptom nor combination of symptoms, which clearly indicates whether concussion or the milder phases of compression exist. Even drunkenness presents symptoms that resemble concussion, the odor of the breath being the most reliable distinguishing feature. And when an intoxicated person receives a blow upon the head, it is often difficult to determine whether the insensibility is due to concussion or to inebriation, or to both.

In the slighter cases of concussion the effects last only a few minutes; there is temporary loss of sensibility and of muscular power, yet in a short time the patient regains his faculties and functions, and goes about his business as if nothing had happened, and may not be conscious of having been hurt. In the severest forms of concussion the patient drops senseless and motionless; breathing nearly ceases, and the pulse can not be felt at the wrist. This condition continues without substantial re-action for a few hours, when death takes place. In some instances concussion proves fatal at once, though hidden fracture and laceration of the brain may have been complications.

In a medium case of concussion, the patient instantaneously falls into an insensible state, and becomes pulseless and motionless; but slightly rallies in a minute or two, so that a slight pulse can be felt, and breathing observed. The face is pallid, and the skin cold; the pupils are usually contracted, but may be normal or dilated; occasionally one pupil is contracted, and the other dilated, so that not much reliance can be placed upon this feature of the case. In some instances the urine and fæces are passed involuntarily. At length the patient rallies enough to be momentarily roused by a smart pinch of the skin of the side of the thorax, or a loud call. The evidence of re-action may be observed by a slower range of the pulse, returning color and warmth in the skin, and the movement of an arm or leg. A very hopeful sign is vomiting, which sometimes may be provoked by sweeping the finger through the fauces. After the stomach has been emptied, complaints of headache will be made, and the patient will appear feverish. Although these are looked upon as favorable signs, inflammation of the brain or of its coverings may ensue, and death result. It is not judicious, then, to pronounce a patient out of danger for a week or two; and he should be kept under restraint as regards eating and exercise until all head symptoms have passed away. A slight extravasation of blood into the arachnoid might become organized and do no harm, yet moderate congestion from cerebral excitement might lead to a degree of irritation and inflammation that would prove fatal. The rupture of a diploic vein from the force of the blow that produced concussion, is likely to result in too little disturbance to attract attention, yet a thrombus may form, or phlebitis arise, that would eventuate in a rigor and dangerous cerebral complications. In brief, difficulties of the head are generally complex in character. It is unreasonable to suppose that a heavy blow upon the head would result alone in bruising the scalp and bewildering the senses through mental shock. The force would probably reach the inter-cranial membranes and the brain substance, rupturing minute vessels, and causing effusions which might prove serious sources of evil sooner or later.

The treatment for concussion in its early stages is practically of a negative character. The patient is to be placed in a comfortable place, and turned from one side to the other occasionally, though such movements should always be gently made. A cold perspiration is to be wiped from the face and hands, and dry mustard should be sprinkled in the stockings. It is useless to attempt to administer stimulants or to abstract blood. If re-action come on, it may be well to apply a dilute tincture of aconite to the head; and in violent determination of blood to the head, during re-active changes, ice may be placed so as to abstract excessive heat from the congested region. A cathartic should not be given by the stomach, but the bowels may be moved with enemas. Although vomiting is not uncommon during re-action, it is not judicious to administer an emetic, for, if it do not operate, it produces vital depression.

It is worthy of remark, when there is hemiplegia, or partial paralysis upon one side of the body, that the brain upon the opposite side is the part of the cerebral mass which is suffering most. Probably there is an effusion of serum upon the convexity of the hemisphere.

A person overcome with heat presents all the symptoms which are exhibited in concussion of the brain, therefore when an individual, during hot weather, is found in an insensible state, it may be difficult to determine the real cause of the cerebral disturbance, unless the head bear evidence of having received a severe blow.

Tickling, pinching, and squeezing the patient in the sides of the chest, are the best ways to arouse him, no matter what may have been the cause of the sudden loss of consciousness; and, when sensibility is returning, the patient is to be addressed with a loud voice, for all the senses are dull, and need unusual excitement to arouse them.

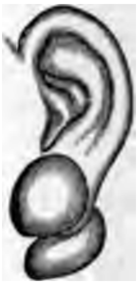
SECTION XII.

DISEASES OF THE EAR.

ANATOMICALLY the ear is divided into three departments—the external, the middle, and the internal—and a consideration of the diseases of the same would very naturally be subjected to the same divisions. The external ear embraces the auricle and the meatus auditorius externus, including the outer surface of the membrana tympani; the middle is the tympanum, or drum, and includes all those structures between the external and internal divisions, and the Eustachian tube; the internal ear covers that complicated copartment called the labyrinth, in which the auditory nerve is distributed.

Difficulties of the external ear are numerous, and, from their location, are readily reached. Sometimes the auricle is undeveloped, there being no more visible sign of an auditory apparatus than there is in birds and reptiles. Occasionally the cartilage of the auricle is defective, the ear dropping down like that of a hound or spaniel. The lobule is often perforated for the hanging of ornaments. The operation is too simple and common to reach surgical hands; it is executed by arming a needle with a thread or piece of silver wire, and transfixing the lobule—a vial-cork or piece of soft wood being used on the side the needle is to emerge, to support the pulpy structure. The thread or wire is formed into a loop, and left in the wound for a few days or weeks, until a permanent fistula is established. Gold ornaments may then be suspended from the ears. But in some cases the jewelry is fraudulent, and the corroding metal provokes ulceration, which, unless the cause be removed, will cut a fissure clear through the lobule. In other cases the irritation produced by brass ear-rings will cause tumors the size of peas to develop in the lobule. I have excised such tumors in many instances. In the removal care should be exercised not to disfigure the lobule, nor to leave an opening noticeably large. In two instances I have closed fissures of the lobules which were caused by the violent tearing of ear-rings from their place. I freshened the two borders, and then drew the pared surfaces together with delicate silver wire. The operations proved entirely successful.

FIG. 125.



Tumors of lobe of ear.

The auricle is subject to various cutaneous affections, but mostly to eczema. Children with tinea capitis are apt to have cracks form in the crevice between the pinna and the scalp; and the disease is liable to spread to the concha and meatus. The treatment for cutaneous affections of the auricle is the same as for these diseases on other parts of the body. Eczema will generally yield to the influence of a reduced citrine ointment. A pomade containing a small amount of oil of juniper, or Fowler's solution, does very well; so does the glycerole of tar. A favorite prescription, which appears in other places, is the following:

℞ Simple cerate, ℥j.
Citrine ointment, ʒij.
Oil bitter almonds, gtt. iv. M.
S. Anoint lightly night and morning.

Diseases of the external auditory meatus and canal are numerous, and generally amenable to treatment. To view the passage in its deeper parts requires the use of a speculum or dilating instrument. The canal may be illuminated with an auroscope or refracting mirrors. In ordinary practice the use of the silver tube made for the purpose of examining the external auditory canal, answers a very good purpose. A nest of three or four sizes is convenient for varied uses. And it is to be borne in mind that if the auricle is lifted, drawn forwards, and pulled away from the head, the canal is straightened so that in a good light the entire passage and the membrana tympani can be seen. It is well when a patient presents himself for the treatment of an ear affection, to make an instrumental examination, in order that the difficulty may be understood as far as may be, and to impress the sufferer with the importance of the matter.

Accumulations of cerumen in the external auditory passage are quite common, and do less mischief than is generally supposed.

In advanced life, when lumps of hard and dry wax get packed in the auditory canal, the result is unpleasant, and sometimes calculated to excite alarm. An ear thus blocked up may produce giddiness, confusion of the mind, and symptoms that the patient may interpret as those of impending apoplexy. Pledgets of lint crowded into the auditory canal to cure ear-ache, may remain there for years, and, with ceruminous collections, completely occlude the passage, producing deafness and unpleasant sensations. The removal of wads of lint and ceruminous accumulations, is generally not a difficult matter. Syringing the canal with warm water loosens the impacted mass, and otherwise favors dislodgment. A small stream of water from the nozzle of an ear-syringe, directed against the walls of the meatus while the auricle is lifted and pulled upon, gets behind the obstruction, so that the return current from the membrana tympani helps to wash away the obstacle. A small quantity of oil dropped into the ear will commonly soften inspissated cerumen, and thus prepare it for easy removal. A delicate instrument, like a cataract needle, may be used to facilitate the escape of ceruminous obstructions. The removal of plugs of indurated cerumen, that have lain in contact with the membrana tympani, may be followed by extreme acuteness of the auditory sense, rendering ordinary sounds of the voice painfully unpleasant.

Excessive secretions of liquid cerumen are not uncommon in children—disagreeable discharges being the consequence. This state is to be corrected more by the administration of tonics and stomachics than by the use of astringents in the auditory passages.

Small abscesses not unfrequently form in the membranous walls of the external meatus, probably having their seat in the ceruminous glands. They are exceedingly painful while forming, but rapidly lose their sensitiveness as soon as the pustule breaks and discharges. During the development of one of these abscesses it may be necessary to administer chloral internally, and apply hot fomentations, or heat in some form, to the external ar. The inflamed part is swollen, and so extremely sensitive hat movements of the auricle in attempts to examine the meatus are attended with the keenest pain. If the pustule or abscess does not burst in two or three days from the commencement of the difficulty, it may be punctured with a slender knife or straight cataract needle. But the operation is attended with such excruciating pain that I have felt obliged to anæsthetize the patient before attempting to open and evacuate the phlegmon.

Acute inflammation of the external meatus may follow injuries and exposures to violent changes of temperature. Hot sand blown in the ear from a furnace, would inflame the parts which were super-heated and chafed. Arising from whatever cause, inflammation of the meatus is attended with swelling, pain, and all the symptoms of forming abscess. The difficulty is to be overcome by the use of poultices, fomentations, or a hot plate wrapped in a napkin and laid over the ear. Where the affection seems to depend upon constitutional disorders, attention must be given to the general health.

Chronic inflammation of the external meatus may be established by repeated attacks of acute inflammation, and from cold water getting into the ears while bathing. Persons working in mills where dust lodges in the ears, and where deafening sounds have to be endured day after day, often complain of a sensation of fullness in the ears, and of disagreeable buzzings, hissings, and singings. An itching sensation may lead to the use of a pin, pushed into the meatus head foremost. This may become a habit which aggravates the difficulty. The cure depends much upon the removal of the cause, though some of the effects may remain indefinitely. The wearing of pledgets of soft lint in the concha and meatus is advisable, as the fibrous body acts as a filter to arrest irritating dust, and keeps cold currents of air from rushing into the canal.

Not uncommonly chronic inflammation of the auditory passage is attended with a partial or complete arrest of the secretion of cerumen, and the production of dry scales along the walls of the meatus. Impaired hearing is a common sequence of such a state of the auditory canal. This feature of the disease may be corrected by the topical use of glycerine and Fowler's solution—a drop of the latter to a drachm of the former. This compound may be applied morning and evening with a camel's pencil, or with a light flock of raw cotton twisted upon the end of a match.

Another form of chronic inflammation of the external meatus is accompanied by a copious purulent discharge, which may be denominated otorrhœa. It is often termed a catarrhal affection of the ear; and is confined mostly to childhood. Often the discharge is highly offensive to the smell. Victims of scarlatina frequently suffer from otorrhœa, though the purulency may come from ulceration going on in the middle ear. To arrest the purulent discharge, the following combination will be found excellent:

℞ Glycerine, f ʒij.
Nitric acid, gtt. iv. M.

S. Use in the ear twice a day with a match and lint swab or a camel's hair pencil.

When the discharge is offensive to the sense of smell, the following may be used:

℞ Water, glycerine, aa. f℥j.
Borax, grs. iv.
Salicylic acid, grs. ij. M.

S. Use in the ear twice a day, applying the wash with a swab or syringe.

The internal use of the "acid solution of iron," sulphur, phosphorus, and the iodides, may be necessary to correct the morbid constitutional condition which contributes to the continuance of such discharges.

Polypous growths from the membranous walls of the meatus auditorius externus are not altogether rare. They are apt to grow from the deeper parts of the canal, and have slender pedicles. Those persons who have free discharges from the ears are most liable to polypi. I have seen them in ears that had been deranged from infancy, otorrhœa being present a large part of the time. In some instances the disease is hereditary. I was once called to remove a polypus of the ear in a gentleman sixty years of age; and, in talking with the family about ear difficulties, I found that several of the children had unpleasant discharges from the ears, and two had quite large polypi; two of the children had ears that never gave them trouble.

A tumor of a pinkish hue is detected in the meatus, and its character is discovered by the pressure of a probe. If the tumor be an exostosis it will be hard, but if soft the probability is that a polypus exists. When left undisturbed, polypoid growths may project into the concha, and be plainly visible. In humid weather they appear to temporarily increase in size, and to shrink correspondingly in a dry atmosphere. Aural polypi may have their attachment upon the outer surface of the membrana tympani, and even from the inner surface when the drum is perforated by ulceration. It is to be borne in mind that ulcers in the external meatus may have springing from their borders a set of fungous granulations which closely resemble polypoid growths, especially if they fill the passage. It requires tact and discrimination to determine the difference between the two morbid structures. Writers upon aural surgery describe two or three kinds of polypi that are peculiar to the ear; but it is doubtful whether a greater distinction exists between polypoid growths found in the auditory passages, than has been observed between similar morbid productions having their seat in the nose, or other cavities where polypi grow.

The treatment of aural polypus consists in uprooting the growth and so managing the base of the pedicle that the pulpy and gelatinous mass shall not be reproduced. It is generally easy enough to remove the tumor by wrenching it from its pedicle, yet a fresh tumor is about sure to come again unless effective means be taken to destroy the matrix, or foot-stalk. A wire noose projecting from a slender pair of canulæ may be made to surround a polypus, when a few twists of the instrument will remove the growth; but this method leaves a piece of the pedicle, and a new tumor readily springs from it. I prefer to use a delicate pair of forceps, with which the growth may be grasped, and twisted until the entire morbid mass is uprooted. But this method is uncertain in its results, from the fact that one or more morbid cells may be left behind, to form the starting points of new shoots. It is better, then, to destroy the vitality of polypi with arsenic or chloride of zinc; and these escharotics can be used without inflicting injury upon healthy structures. I commonly use a paste of chloride of zinc, and apply it with splinters of wood the size and form of ordinary tooth-picks. But great care must be exercised in the application. A freshly made paste being ready, and the patient placed in a good light, the operator dips a sharp and slender piece of wood in the caustic to the depth of a quarter of an inch, and then, after wiping the stick nearly dry, carries the point to the tumor, and presses it into the pulpy mass. The point of the caustic bearer is left in the polypus a few minutes, to allow the morbid cells to imbibe the escharotic. This operation may be repeated every day for a week, unless the tumor dies and comes away before that time. And when the disengagement occurs, it is pretty certain that no polypoid cell remains behind. The liquefied zinc passes from cell to cell, until all are reached, and so little impression is made upon the healthy tissue of the base of the tumor, that a slough of the polypus occurs without much irritation being excited. An arsenical paste may be used in the same manner, and the effects are not unlike those which follow the application of zinc. A minute quantity of either of these agents, applied to the base of a polypus that has been removed with forceps, will prevent reproduction of the tumor.

The membrana tympani is subject to diseases and injuries; and being an important vibratory membrane of the auditory apparatus, a slight modification of its physical character is likely to result in impairment of the sense of hearing. The membrana tympani may be seen if the ear is in a good light, and the canal leading to the drum be straightened by lifting the auricle and pulling it away from the head. A tubular speculum may be employed to some advantage in examining the membrane, especially if a concave reflecting mirror is made to throw a stream of strong light through the tube. The integrity of the membrana tympani can be tested by closing the lips and nostrils while breath from the lungs is made to distend the respiratory tracts. The air finding no other means of escape, rushes through the Eustachian tubes, and out through any hole that may exist in the membrana tympani. If no opening exist in the membrane, the air is restrained in the middle ear, yet it bulges the tympanic membrane outwards, and produces a sensation of fullness in the ears.

The membrana tympani may be punctured by the introduction of pointed instruments, and lacerated by the explosion of artillery, especially if the noise come unexpectedly, as the muscles which regulate the tension of the membrane have been taken unguardedly. A slap on the ear with the open hand has been known to rupture the membrana tympani, propably by suddenly compressing the air in the meatus. Undue force employed in syringing the ear might burst the drum; violent blowing of the nose has torn the membrane. A bursting of the membrana tympani is attended with pain, and the discharge of a few drops of blood from the ear; yet the hearing is not necessarily impaired, and the rent may heal in a few days, leaving no mark of the injury except a pale cicatricial line. However, after rupture of the membrana tympani, a permanent fissure, or opening in some shape, is apt to be left. The entire membrane is frequently lost by ulcerative action, and hearing is thereby impaired, but complete deafness rarely follows the loss of both membranes. The basis of the auditory apparatus is in the labyrinth, or internal [illegible] and the other parts are accessory; therefore the sense of hearing may be possessed, though the middle and external divisions of the ear be disorganized.

Inflammation of the membrana tympani may be treated successfully, by gently syringing or showering the membrane with warm water several times a day. If it seem desirable to use medicated washes, four or five drops of the fluid extract of pinus canadensis may be added to an ounce of warm water, and carefully thrown into the ear with a syringe. After the membranæ tympani have been subjected to sudden and loud noises, and to the irritation of cold currents of air, a feeling of heat, throbbing, and tension is experienced in the ears: and if tinnitus come on, with pain in the side of the head, especially when the jaw is moved, acute inflammation of the tympanic membranes may be presumed: and further, if upon inspection the membrane presents a pinkish or dull reddish hue, the evidence of inflammation is quite positive. However, little can be done except to enjoin quietude, and to employ remedies just enumerated, as warm and medicated washes. If an ulcerative action be discovered a weak solution of chloride of zinc—two grains to the ounce of water—should be carried to the diseased spot with a small swab made of cotton and a cylindrical match. The application should be repeated daily for a week or two, or until the ulceration ceases.

Perforation of the membrana tympani from accident or disease is a very common affair. The aperture may be round, oval, irregular, or ragged in outline. The opening may be seen in a good light, particularly if a speculum and reflector are used; and if the Eustachian tube be not obstructed, the patient can blow air through the aperture, the passage of which gives a whistling sound. If the patient be a smoker he can, by closing the mouth and nose, blow smoke through the perforation. If a considerable portion of the membrana tympani be lost, and the ossicles of the tympanum keep their place, the head of the malleus may be seen near the roof of the meatus.

A loose ball of cotton-wool can sometimes be worn with advantage by those who are partially deaf from perforation of the membrana tympani. To a certain extent the fibrous wad is a substitute for the lost membrane. It arrests the passage of dust and breaks the force of heavy sounds. To gain the greatest benefit from the use of cotton-wool, the pledgets should not be much compressed, and they should be made from fresh material every day. And it is especially to be remembered that the wool is to be moistened and carefully adjusted. A dry flock carelessly applied is worse than useless. An artificial membrana tympani has been constructed of a thin disc of rubber. A piece of silver wire an inch long is attached obliquely to the centre of the disc, and serves as a handle to insert and remove the artificial "drum-head." The mode of using the disc is thus described by its inventor: "After accurately noting the size of the inner extremity of the meatus to which the natural membrane was attached, the operator should proceed to cut the artificial membrane as nearly the size and shape of the natural one as possible, taking care at the same time to keep the margin quite smooth and regular. The patient should then be placed with the head inclined to the opposite shoulder, while a strong light is thrown into the meatus, which, if liable to discharge, should have been previously syringed. The operator will next take the artificial membrane, and having moistened it with warm water, pass it, by means of the silver wire, gently inwards, until it has reached what he considers the natural position. This he will ascertain by the occurrence of a faint bubbling sound caused by the escape of the slightly compressed air beyond it: he will also feel a slight obstruction offered to its further passage by the remnant of the natural membrane. Should any attempt be made to pass the artificial membrane beyond this point, the patient will complain of pain, which up till then had not been felt. The most certain test, however, of the proper placing of the artificial membrane is the sensation of the patient, who discovers by the sound of his own voice, or that of the surgeon, or by the movement of his tongue and lips, that his hearing has been suddenly improved."

The artificial membrana tympani should be smaller than the calibre of the meatus if the perforation be small, and a little larger than the meatus if the natural membrane be entirely gone. The silver wire should be so bent that it does not rest unpleasantly upon any part of the canal. It is only to be worn an hour or two at a time at first, or until no discomfort arises from being worn for a longer period. It is generally best to remove it every night. If other diseases of either the middle or internal ear exist, the artificial membrane may not improve the hearing.

AFFECTIONS OF THE EUSTACHIAN TUBE.

What the vent is to a common drum, the Eustachian tube is to the tympanum of the ear. The air in the middle ear is changed by means of the Eustachian passage, the walls of which are under the influence of muscles that open and close the tube by the acts of swallowing, talking, gaping, coughing, sneezing, etc. When the throat is in a quiet state the patulous walls of the tube rest in contact, and act as a "weak valve," but a slight movement of the muscles of the palate and pharynx extends to the Eustachian tube, rendering it permeable to air and fluids, if any be ready to pass either way. If the mouth and nostrils be closed, and air be forced into the tympanum from the lungs, a feeling of distension is produced which does not subside until the act of swallowing be performed, when it disappears at once. This proves that the tube in a state of rest is closed, and has to be opened by some of the acts just referred to. Even after an effort of sneezing the fullness in the tympanum is perceived, and is not relieved quickly without the act of swallowing.

Obstruction of the Eustachian tube is a common cause of deafness. Catarrhal affections of the nose, and a conjested condition of the pharynx, implicate the walls of the Eustachian tubes by extension of the disease to those passages. The obstruction consists partly in collections of mucus, and partly in a thickening of the lining membranes of those canals. Young persons with enlarged tonsils are frequently deaf, and the defect of hearing arises from the pressure extending to the mouths of the Eustachian tubes. The young may be deaf from disorder of the external and internal divisions of the ear, but nasal, faucial, and pharyngeal troubles are so much more commonly the cause of impaired hearing, that the experienced practitioner never thinks his diagnosis complete until he has carefully examined the nose, mouth and throat. Children complain of a stuffiness of the nose and ears when laboring under catarrhal affections, aud of unpleasant noises in the ears, as those of buzzing, ringing, or hissing. They are apt to snore when sound asleep, and can not be easily awakened. The mucous membrane of the mouth, fauces, aud pharynx, is red and tumid. If the tonsils be in a hypertrophied condition, they should be excised at once. Deafness caused by enlarged tonsils is not uncommon, and excision of the glandular masses proves decidedly beneficial.

Polypus of the nose may also be a cause of deafness, the morbid growth blocking up the mouth of the Eustachian tube, and otherwise proving an obstacle to acute hearing. Removal of the polypus is, of course, the only method of benefitting the case.

The Eustachian catheter has been much extolled as a means of treating deafness arising from partial closure of the Eustachian tubes, the obstruction consisting of mucus and a thickening of the mucous membranes reaching from the throat to the middle ear. By the aid of an air-press a strong current of water or air can be forced through the catheter and Eustachian tube. Medicated vapors could be employed with the same apparatus. The point of the Eustachian catheter may be made to enter the trumpet shaped mouth of the Eustachian tube, by carrying the instrument along the floor of the nostril until its point strikes the posterior wall of the pharynx, then it is withdrawn three quarters of an inch, and rotated one quarter of a circle the point turned outward and slightly upward by the motion, when with a gentle sliding motion the point drops into the orifice sought. The evidence of its being in the right place comes from the steadiness the catheter assumes as soon as its point drops into the Eustachian mouth. I have quickly instructed a patient to introduce the Eustachian catheter into his own nose. Then, by having a piece of rubber tubing attached to the outer extremity of the catheter he could bend the hose into his lips, and with a puff from the lungs, give his Eustachian tube and middle ear an air douche.

Some benefit has arisen from the use of air, vapor, and water douches administered by means of an air-press and the Eustachian catheter, but not as much as was anticipated when the claims of the apparatus were directed to the attention of the medical profession. In fact the instruments are rarely used now except by specialists who derive notoriety from the display of apparatus which is rare, complex, and has the appearance of being "scientific."

A simple method of introducing medicated vapors into the tympanum is as follows: a mixture of equal parts of acetic ether and tincture of iodine, may be put into a common inhaler or china tea-pot, which contains a gill of hot water, when the patient is to draw the vapor into his throat, and after closing the mouth and nose, he is to force it into the tympanum. From five to twenty drops of the acetic ether and tincture of iodine may be used at each experiment. When the vapor reaches the tympanum an agreeable sensation of warmth is felt in the ear. The operation may be repeated after the act of swallowing, which helps to discharge an undue pressure of air in the tympanum. A few trials each day will accomplish all that may reasonably be expected from local medication.

Persons of adult age, in feeble health, sometimes are deaf from *relaxation of the mucous membrane of the fauces:* and the trouble is increased by smoking to excess. Relief depends upon gargling the throat with astringents, the abandonment of tobacco in any form, and the use of iron, mineral acids, arsenic, phosphorus, and plenty of nutritious, though easily digested food. In fact, about the same course of treatment is necessary to improve a thickened condition of the mucous membrane of the fauces and Eustachian tube. In most of the diseases of the nose and fauces which produce deafness, the employment of remedies which are known to improve scrofulous, anæmic, and dibilitated subjects, is not to be relaxed for months, though the remedies may be changed every week.

Puncturing the membrana tympani is a justifiable operation when there is a collection of pus or muco-purulent fluid in the tympanum, and when deafness exists from stricture or occlusion of the Eustachian tube. It has also been recommended when the membrana tympani is thickened from chronic inflammation. The operation is not difficult to execute, yet should be performed with much care. A speculum may be employed to bring the membrane into clear view, or a reflecting mirror to light up the auditory passage. By straightening the meatus in a strong light, the operator is enabled to see the membrana tympani, and he can then puncture the membrane without the trouble of a complicated apparatus. The place to make the aperture is below the center of the membrane, and a little before or behind the central point, in order to escape touching the head or handle of the malleus. The puncturing instrument may be a straight cataract needle, a slender knife, or an exploring needle. In the event the puncture, which has proved beneficial, closes, and the difficulty for which it was made returns, another puncture should be made, and a flap formed, by means of a V-shaped incision. Such an aperture is not likely to close. The daily passage of a probe for a week tends to obviate a closure of the wound.

The ossicles of the tympanum may become anchylosed, or the foot of the stapes blended with the border of the fenestra ovalis, and thus impair hearing; or some of the osseous chain may become disconnected through ulceration of their fibrous coverings. The incus is often lost, and not unfrequently the malleus, the little bones escaping with fluids that find exit through an aperture of the membrana tympani. Hearing is liable to be seriously impaired by a loss of one or more of the ossicles; but if the stapes remain attached to the membrane that fills the fenestra ovalis, a fair degree of hearing may be enjoyed.

Acute inflammation of the mucous membrane of the tympanum, and of the lining of the mastoid cells, is not uncommon. The affection is attended with pain in the ear, dullness of hearing, and unpleasant noises in the head. If the membrana tympani be perforated, a watery or muco-purulent discharge from the external meatus may be observed. The treatment consists in applying hot fomentations to the ear and side of the head; in the hypodermic use of morphia and atropia in the mastoid region; in the administration of chloral and arterial sedatives internally; and in the adoption of measures which generally relieve local and general fever. The inflammatory attack may subside in a few days without leaving any bad result, or it may run so high that delirium supervenes, and even death results. The discharge of pus through the Eustachian tube into the throat, or by an aperture of the membrana tympani, is usually attended with relief. The under jaw moves more easily, and deglutition is performed without pain, yet creaking, buzzing, and other unpleasant noises may continue for weeks or months. In obstinate cases it is well to try iodide of potassium in large doses for a few days, withdrawing the medicine as soon as a decided impression, peculiar to the action of the remedy, is made. When the membrana tympani is found bulging, and other signs of the accumulation of fluids in the tympanum are present, the membrane should be punctured at once. Attention should be paid to the membranæ tympani in patients affected with scarlatina, especially if the ears seem to be sources of pain and distress. It is not uncommon for strumous children to die from the pressure made upon the inflamed structures of the tympanum by puriform fluids that can not find escape.

Inflammation of the lining of the mastoid cells, and of the bone itself, resulting in caries or necrosis, may exist without seriously implicating the entire auditory apparatus. Tuberculosis, exposure to cold and wet, and morbid influences not always understood, are causes which lead to inflammation of the mastoid structures; and relief is sought by the application of hot poultices, infusions, hypodermic injections of the sulphates of morphia and atropia, and perforating the bone behind the ear with a drill. I have obtained astonishingly favorable results by establishing drainage in this way. A condition of abscess in the mastoid cells often needs a perforation of the outer shell of bone, in order that accumulatious of fluid may be discharged. A small trephine may be advantageously employed to make the perforation.

Affections of the internal ear—the labyrinth and auditory nerve—are not easy to diagnose, and very hard to cure. There may be excessive vascularity and thickening of the delicate membranes that line the vestibule, semicircular canals and cochlea; the labyrinthine fluid may be scanty or in excess; the osseous walls of minute canals may encroach upon the soft structures within; and the auditory nerve may be atrophied, or rendered inactive through passive or fatty degeneration. In some cases the auditory nerves are pressed upon by tumors of the brain, or their functions are destroyed by thickening of the dura mater. I have seen several children who were profoundly deaf after experiencing severe attacks of cerebro-spinal meningitis. In some instances gradual recovery takes place, and in many no change for the better occurs.

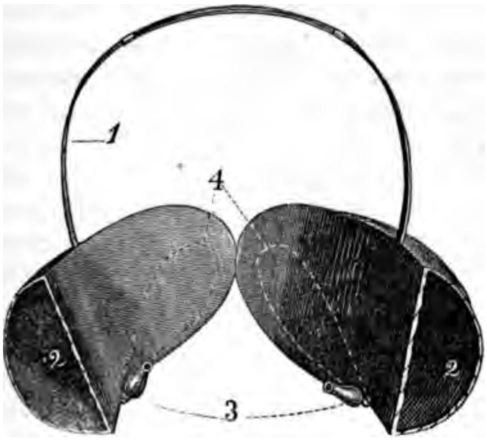
The cases are not rare, especially in advanced life, in which the function of hearing is lost, yet no symptom of disease can be found during life, nor mark of it after death. Persons in middle life who have undergone excessive exertion, exhaustive hemorrhages, prolonged anxiety, and been subjected to other debilitating influences, have become deaf, yet recovered their hearing under rest and recuperating changes.

The injudicious use of quinia is a common cause of ringing in the ears and deafness. In miasmatic regions a large proportion of the people can not hear distinctly. Few are wholly deaf, but many complain of impaired hearing and disagreeable sounds in the ears. Probably the auditory nerves are partially paralyzed by the effects of large doses of the medicine which is so generally taken for the cure of miasmatic disorders. Tinnitus is a common complaint among those wo have taken quinine.

There are few remedial agencies which are known to remove diseases of the internal ear. The parts affected are in the recesses of the petrous bone, therefore beyond the reach of manipulation or topical medication. Blisters and sutures have been largely employed about the ears to remove difficulties of the deeper structures of the auditory apparatus, but without the evidence of improvement. Galvanism has been lauded by the champions of the subtle and mysterious, yet without any improvement beyond that which is imaginative or pretended. A simple snuff that will excite sneezing without doing any mischief, sometimes produces temporary improvement in the sense of hearing. The use of strychnia does no good, except as a general tonic.

Children born totally deaf, or who become so early in life, never acquire speech, yet they may understand what is said in their presence by the motion of the lips of the speaker. Mutes can be taught to write, and to converse by means of digital signs. Those persons who lose the sense of hearing while young, yet after the faculty of speech has been acquired, speak in a childish voice all their lives.

FIG. 126.



Ear-cornet. No. 1 is the spring which goes over the top of the head from one trumpet to the other; No. 2 is the open mouths of the trumpets; No. 3 points to the nipple which fit in the meatus; and No. 4 refers to the coils in the trumpets.

The incurably though not totally deaf can be provided with an ear trumpet, or magnifier of sound. The instrument, whatever be its form, should assist in collecting, concentrating, and directing to the external meatus of the ear, a greater quantity of sound than could reach it without such aid. However, the deaf do not want an ear trumpet that merely intensifies sound, yet renders it indistinct by reverberation. It annoys a deaf person to bawl in his ears; what he craves is distinctness of articulation. The simple tin horn is the best instrument for those listening to distant sounds. Its wide mouth and conical canal collect, concentrate, and transmit sound with great intensity upon the vibrating membranes of the ear. The quantity of sound collected depends much upon the size of the instrument, hence a very deaf person would require a large trumpet, and an individual moderately deaf would find a small instrument served his purpose best.

The ear-cornet has two coiled trumpets covered with black silk or paint, and held together by a steel spring which passes over the top of the head. The trumpets are so small that they can be concealed by an ingenious arrangement of the hair into "ear-locks." The advantages claimed for the cornet are that the nipple-like pieces fit in the external meatus, and are held there by the spring that goes over the top of the head, so that the hands are not needed to hold the instrument; also that it is so nearly concealed that strangers might not detect the disguise. However, it is not often that the nipple of the cornet accurately fits the meatus, so that it can be worn with ease and be efficient in transmitting sound. Persons who have been accustomed to the trumpet rarely adopt the cornet in its stead.

For DISEASES OF THE EYE, see author's MANUAL OF EYE SURGERY.

SECTION XIII.

DISEASES OF THE NOSE.

HYPERTROPHY of the sebaceous follicles of the integument of the nose, constituting a morbid growth similiar to elephantiasis of other parts of the body, is occasionally met in individuals who have arrived at forty-five years of age. Sometimes the excrescence is lobulated or irregular in outline, and an occasional stiff hair projects from the unsightly mass. The disease seems to start in a "red nose," which may be eczematous, and is aggravated by the use of whiskey and other alcoholic stimulants.

After the hypertrophy has reached disgusting proportions, and abstinence from strong drink does not result in a return of the nose to its natural size, the only treatment available is to excise the morbid mass. The operator keeps the forefinger of his left hand in the nose to guard against going too deep with the knife, or cutting into the nostrils. The hemorrhage will be quite profuse, but not dangerous. The traumatic surface is to be dressed with water for a few days, then with calamine cerate or Meyer's ointment. The cicatrization does not disfigure the nose; and the disease is not likely to return.

Cancerous diseases are liable to attack the nose; and the carcinomatous form is exceedingly formidable. Epithelioma begins in a vascular tubercle, ulcerates, and destroys whatever it comes in contact with, whether integument, cartilage, or bone. The chloride of zinc paste is the best escharotic to be used in the destruction of the morbid structure. After removal of the slough, the wound heals quickly; but the systemic taint is to be fought with "acid solution of iron," Fowler's solution, phosphorus, and iodoform.

Carcinoma is not to be excised, but attacked with chloride of zinc-paste when the morbid growth can be reached. If the excrescence be inside the nose the use of caustic arrows or splinters of wood dipped in a strong solution of chloride of zinc, may prove an efficient method of arresting the development of the local manifestation, but the disease in some form is likely to bring about a fatal issue in a few months.

Syphilitic ulcers of the alæ nasi are to be treated as if located in other regions. A solution of salicylic acid and borax, two or three grains of each to the ounce of water, is an excellent local remedy for venereal sores.

Calculous concretions or rhinolithes have been known to form in the nasal cavities. Their nucleus may be any extraneous body, as a bead, bean, or cherry-stone; and the deposits consist of carbonate of lime, magnesia, and mucus. The presence of such a mass excites irritation and nasal troubles of various kinds, besides destroying the sense of smell. The probe generally discovers the foreign substance; and a blunt hook or slender forceps may effect removal of the concretion.

Occlusion and contraction of the anterior nares may result from burns and ulcerative diseases that are followed by contracting cicatrices. Children have been born with membranous occlusion of one or both nasal apertures. The difficulty can generally be overcome by excision and the use of bougies. The incising process should be as free as the nature of the case will admit, and the bougie or plug should be larger than the natural opening, for the tendency is to contract and close again.

The septum nasi is exceedingly liable to ulceration, which often results in perforation of the cartilage, so that a permanent fistulous opening is established. Strumous subjects are prone to the disease, and those who are in danger of phthisis. The ulcer begins on one side, and soon the same ulcerative state will assail the other side, just opposite the first, and the two progress until perforation is accomplished. There is generally no pain at the seat of ulceration, but an itching or tickling sensation that leads the patient to dig the spot with his finger. This frequently produces a brisk hemorrhage. The ulcers are located well inside the nasal apertures at spots where the thumb and finger come nearest together when inserted in the nostrils. If the nasal orifice of one side be exposed to a good light, an observer by pulling the ala a little outward and upward, can see the ulcerative spot. The lcer is oval or circular, and appears quite red when not covered rith a crust. Its presence causes pain in the head on the side rhere it exists. The suffering is in the forehead and about the ye, hence the cause is not suspected by the inexperienced in such natters. When a patient comes to me with a sallow complexion, nd complains of pain about the forehead and eyes, the indications lead me to examine the nasal septum at once. The breath of ndividuals having ozœna is usually offensive, but the stench may ot come from the ulcer. They may have disease of the schneilerian membrane, or of the respiratory passages, as the disease is ot always restricted to simple ulcer of the septum. Persons aving nasal ulcers are apt to exhibit vascular conjunctivæ, and noticeable redness at the edges of the eyelids. Frequently the ense of sight is unreliable from a blur suddenly appearing when he eyes are directed to minute objects, as in reading fine print. ometimes there is a feeling of dryness in the nasal passages, the atural pituitary mucus being suppressed or inspissated.

The treatment is local and general, and to be kept up for reeks and even months, before the disease is thoroughly masered. And a return of the same difficulty in a year or two is ot uncommon. Persons having an ulcer of the septum are rone to be "picking the nose"—a habit that is both repulsive nd injurious; therefore, to insure a cure a demand must be enorced that the nose be let alone, except so far as the use of the andkerchief is concerned. The ulcer is to be treated by rubing it every day with the following ointment:

℞ Simple cerate, ℥j.
Citrine ointment, ʒij.
Pulv. sub nit. bismuth, grs. xx.
Oil bitter almonds, gtt. v. M.

Apply by covering the end of the fore finger with a soft piece of loth, and, after lightly touching the ointment, gently yet effectvely rubbing the ulcerated spot. At first a thick crust may protect the ulcer from the direct contact of the cerate, but in a ay or two the raw surface will be reached. The internal use of ron, mineral acid, arsenic, sulphur, and phosphorus, produces onstitutional changes which favor the curative process. Someimes I find cases that seem to need the same treatment as tetter r eczema would require. In fact, ulcers of the cartilaginous eptum of the nose are often found in eczematous subjects.

In the event that the septum is perforated, and the edges of the opening are healed, they may be touched occasionally with nitrate of silver or with a solution of sulphate of zinc; but if the borders of the aperture be cicatrized, the local disease is spent, a spontaneous cure having been accomplished.

FOREIGN BODIES IN THE NOSE.

It is not uncommon for children to push beads, buttons, beans, and smooth bodies of various kinds, into the nasal cavities; and although they generally do little harm, the parents become fearfully alarmed, and in their efforts to remove the obstruction they push it further in. The child, seeing the agitation of the parents, gets into a distressed state, and often by the exhibition of pugnacity, thwarts the efforts of the surgeon. In most instances the body which has entered one of the anterior nasal apertures, can, with a probe or slender pencil, be pushed along the inferior meatus until it falls upon the root of the tongue, which quickly brings it to the lips. It has been recommended that a stream of water be poured into the opposite nostril, with the expectation that the current will strike the velum or throat, and return through the other nostril with enough power to dislodge the obstacle, but I have not had occasion to try the method. Closing the open nostril by the pressure of the finger upon the ala, and then blowing in the mouth, will sometimes dislodge a foreign body from the nose. I have succeeded in pushing foreign bodies into the throat, or in extracting them with delicate forceps. Once a woman brought her child to me which had seemingly a tumor of the nose, and an ulcerative disease of one nostril; for the nose was swollen on one side, and an offensive discharge came from it. She had used a syringe for many months, and tried many remedies. The cavity was wholly occluded at a point three-quarters of an inch within the nostril. I carried the points of a delicate pair of toothed forceps to the occluding body, then seized and dragged it forth. It proved to be a cloth-covered button. If it had been glass, or any hard, smooth object, the nasal disturbance would have been inconsiderable. In a few days the child was well. A loop of wire, and a small implement like a crochet needle, have been successfully employed to extract foreign bodies from the nose. I prefer toothed forceps for extracting; and a probe, grooved director, female catheter, bougie, pencil, or some such instrument, can generally be made to push the body into the pharynx, or upon the base of the tongue, when it instantly comes forward to the lips, and never drops into the larynx.

POLYPUS of the nose is not an uncommon disease. The presence of the growth is discovered by its coming forward in humid weather, so it can be seen, and by the fact that it fills the nasal cavity so that air can not pass through. It modifies the voice, produces unpleasant discharges, and bulges out the nose on the side it exists. It is rarely painful, yet it often creates disagreeable sensations. Both nostrils may be invaded. The disease is hereditary in some families. When a large polypus extends backwards to the pharynx, it produces deafness by blocking up the mouth of the Eustachian tube. It may excite a choking sensation. Occasionally a nasal polypus fills the posterior nares, and pushes the soft palate forward, and, in its development, fills the faucial space between the tonsils to an extent that suffocation threatens.

A polypus of the nose springs from the pituitary membrane, either through an aggregation of enlarged follicles, or by a slender pedicle. It is about the color and consistence of a mollusk, and exudes a limpid serosity when squeezed. While developing, or changing its form in wet and dry weather, it produces a tickling sensation which provokes sneezing, and the patient thinks he has taken a fresh cold, especially as the irritation is attended by a free discharge of thin mucus from the nose.

To examine a patient for the purpose of discovering a polypus of the nose, the head is to be thrown back in a good light, and the nostril may be dilated with two hair-pins so bent at the distance of half an inch from their middle, that the ring-ends become spatulæ, or retractors, to spread or dilate a nasal aperture. If the morbid growth be not too far back, its glistening surface may be distinctly seen. Sometimes the patient, by blowing the nose hard, the sound side being closed with the finger, can bring the polypus forward, or more clearly into view.

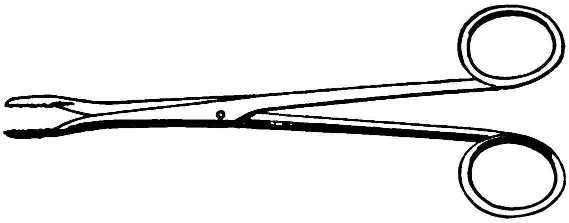
A nasal polypus is to be removed with forceps, whose blades have serrated edges. If they be too narrow they will cut through the gelatinous mass, and not remove much of the growth.

An important feature of success is to get a good grasp near the seat of the tumor's attachment; and to persevere in the matter even if only a part is brought away at a time, until the nostril is clear. In some instances I have used my fore finger as an extractor, carrying it slowly into the nostril and past the attachment of the polypus, when it is easy to bring away the morbid mass. Surgical works contain pictures which show a loop of wire passed around the pedicle of a polypus, as if to be used as an ecraseur, to strangle the growth, but I could never get the noose around the tumor; and I have always effected avulsion with the finger or forceps. The cases are rare in which the entire mass can be extracted, leaving no parent cells to reproduce the disease; but a return can be prevented by the use of a snuff that contains a small amount of pulverized arsenious acid.

℞ Pulv. bayberry, ℥j.
" sassafras, ʒij.
" arsenious acid, grs. ij. M.

S. Use as a snuff twice a day, until every vestige of the disease has disappeared. There is not enough of the arsenic to do any harm, yet sufficient to destroy the polypous cells. Since I adopted this plan I have heard no complaints of a return of the disease.

FIG. 127.



Nasal forceps.

A pedunculated polypus of the posterior nasal aperture, with the tumor extending into the pharynx, is not easy to reach with the forceps, yet with care the pedicle can be grasped and wrenched from its attachment, when it may fall into the throat and for a moment produce a choking sensation, yet the tongue brings it forward to the lips. I have thus removed them which were as large as a hen's egg, and quite firm from the long compression they had sustained. Maisonneuve has made a slit in the soft palate, and through this has seized and dragged the naso-pharyngeal polypus into the mouth, where he could clip its pedicle with scissors. A finger carried behind the velum may be made to execute avulsion of a polypus that can not be reached with forceps.

Fibrous tumors of a polypoid character in the nasal fossæ displace the bony structures that stand in the way of their development, and give to the nose, eyes, and cheek, that misshapen appearance which has been denominated *frog-face.* This is a more serious affection than polypus. The character of the growth is to be determined by introducing a finger into the nostril. A fibrous tumor is firm and resisting, instead of soft and elastic, as is a polypus. In advanced stages of the disease the thin bones of the floor of the orbit yield enough to cause the eye to bulge forward; and the various sinuses of the frontal, ethmoid, and superior maxillary bones become filled and even distorted by offshoots of the nasal tumor. Benign growths of this kind are difficult enough to remove, but if it be found in the midst of an operation that the morbid mass is malignant, the outlook is worse. However, an operation once entered upon need not necessarily be abandoned because the discovery is made that malignancy exists. I have found that malignant tumors of the nasal cavities and adjacent sinuses, come away with ease when a way is made for their delivery.

Fibrous tumors of moderate size can be removed through the anterior nasal aperture, but a large growth could not thus be extracted. It has been proposed by Nelaton, to make an incision in the soft palate and an elongated perforation of the palatine bone, in order to extract the tumor through the mouth; and this might be the best way to effect dislodgement, when the bones which give form to the face are not displaced and distorted, but often such is not the case. When a frog-face exists the antrum of Highmore is more than full, and must be emptied before the eye will go back into the orbit, and the bulging face retreat; consequently the way by the palate may be neglected, and an opening made in the cheek and superior maxillary bone, through which successful dislodgement may be effected. The operation is somewhat formidable, and so is the disease; and to get rid of the latter the former must be executed.

EPISTAXIS, or bleeding from the nose, is sometimes difficult to check. It arises spontaneously from rush of blood to the head, or from the effects of violence, or fungous or ulcerative disease. The pituitary membrane is well supplied with blood-vessels, which ramify so near its outer surface that a slight abrasion gives outlet to a profuse discharge of blood. In fact, the mucous lining of the nasal cavities seems to be a safety-valve in congestions of the head, and spontaneously allows the overcharged vessels to relieve themselves of their burden. Young persons, and those individuals advanced in life who are threatened with apoplexy, are most liable to spontaneous hemorrhages from the nose. Parties who ascend lofty mountains, or reach high altitudes in balloons, frequently have blood gush from the nostrils, on account of the tenuity or lack of pressure of the atmosphere. Young women with menstrual irregularities and excitable nervous systems, will occasionally have rushes of blood to the head, and great heat there while the extremities are cold and bloodless. The carotid arteries will be observed to beat as if ready to burst; and if hemorrhage of the nose sets in, the bleeding may be dangerously exhaustive, especially as such patients are apt to be anæmic constitutionally.

Nasal hemorrhages will commonly cease spontaneously after the congested state of the vessels has been relieved. It is generally well to administer veratrum viride or other arterial and cardiac sedative, lowering the force of the circulation quite decidedly. Ice bags to the back of the head and ice-cold water to the nose and forehead favor coagulation and produce local sedation. Heat applied to the extremities diverts the blood from the head. Ligatures tied tightly around the arms and thighs near the body for a few minutes may operate favorably by shutting off blood from parts that are overcharged. Lint saturated with styptics and pushed into the bleeding nostrils may act as coagulants and tampons; but if the blood flows into the pharynx as fast as it came through the anterior nares before the plugs were inserted, nothing advantageous has been gained.

Syringing water into the nostrils will sometimes arrest a persistent nasal hemorrhage. Instrumental methods of arresting hemorrhage from the nose have already been described under the head of "hemorrhage."

LARVÆ OF THE FLY IN THE NOSE.—In Texas there is a fly which manages to deposit its ova in the nose of man. The occurrence is rare, yet well known. Perhaps it is done while the individual is asleep, or stupid from some cause. The larvæ grow to quite a large size, and create an intolerable annoyance. Whale oil introduced into the nasal cavity with a swab or syringe will destroy them, or chloroform inhaled.

CARIES of the bones of the nose is a serious and troublesome affection. It is accompanied with ulceration of the pituitary membrane, and loss of the thin and porous bones. Necrosis, or death of the nasal, the turbinated, and the delicate portions of ethmoid bones, is more rapidly destructive than ordinary es; and both varieties of disease may exist at the same time. hilis in its advanced stages is commonly the cause, but not ays. I have met with the difficulty in young subjects whose ents were uncontaminated with any venereal disorder. The mous and the enfeebled from any cause may suffer from caries he bones of the nose. Occasionally the walls of the nose ome perforated in the progress of the disease, small abscesses he integument leading the way for the escape of pieces of d bone. The bony septum between the mouth and nose may nvolved, and permanent openings become established between two cavities.

While the disease is in progress the patient suffers from severe n in the forehead and about the eyes, and the discharges from nose are exceedingly offensive; hence the disease is called na. Large crusts, form in the deeper recesses of the nasal ities, which are troublesome to remove. If the nasal bones xfoliated the bridge of the nose sinks down, and the cartila- ous lower extremity turns up, imparting a well-known and racteristic defect of features, which is so much abhorred, and ch no art can disguise.

he treatment for caries and ulcerative diseases of the nose, is stitutional and local. To sustain and improve the general lth, which is generally wretched, iron, mineral acids, sulphur, nic, phosphorus, and a nourishing diet, should constitute lead- features, changes of medicine and diet being made from time ime, to suit the conditions of the patient. Although mercury iodide of potassium are regarded by many as antisyphilitic, do no good in these phases of disease, and often harm.

he local treatment should generally consist in the judicious loyment of disinfectant and deodorizing douches and errhines. lution of salicylic acid and borax may be injected into the l cavities, or the acid may be incorporated in a simple snuff.

INJURIES OF THE FACE.

ne face is an exposed region of the body, therefore it receives riety of injuries. Scratches, lacerations, bruises, incised and tured wounds, and burns, often present themselves for treat- t. While these lesions are not usually dangerous, they should ve careful attention. Erysipelas is more apt to attack the face than other parts of the body, therefore some precaution should be exercised to remove provoking causes. Wounds should be made clean, and dressed with unirritating lotions and cerates. A solution of salicylic acid is effective to neutralize animal poisons and ferments. Discolorations and wounds may be hidden with flesh-colored plaster. Cold cream, camphor ice, and cosmoline are quite useful pomades to apply to slight burns and abrasions.

Bruises of the face followed by ecchymosis or "black and blue" spots are to be covered with isinglass plaster. In a few days the unsightly marks are removed by the disintegration and absorption of the extravasated blood, though several changes of hue will be seen in the bruised skin before the natural color is attained. It does no good to use leeches upon the discolored spots, as they only take the fresh flowing blood. A popular application is a piece of fresh beef, yet it is no better than a common poultice. In a feeble person, whether debilitated through disease, excess of drink, or lack of food, the discoloration continues for many days.

SALIVARY FISTULA.—Wounds of the face sometimes are complicated with division of Stenon's duct. In some cases the saliva will be discharged into the mouth and no outward fistula will follow, yet I have known the termination to be less fortunate. An acquaintance of mine had his face ripped with a band-saw; and the wound was carefully dressed, but in the course of two or three weeks it was found that the saliva came out of a small opening that proved to be a salivary fistula. I used a harness-maker's punch, to perforate the cheek at the spot where the fistula existed, and then closed the opening in the integument with silver sutures. The result was satisfactory. It was found after the removal of the sutures that the saliva flowed into the mouth, and none escaped externally. The treatment for lachrymal fistula will be found in my *Manual of Eye Surgery.*

Disfiguring cicatrices of the face may sometimes be dissected out, and the chasm filled by drawing the edges of the wound together, or by transplanting flaps of integument from adjacent parts. Plastic operations are more successful in removing horrid deformities of the face caused by the puckering and shrinking of inodular tissue, than any other means yet employed.

SECTION XIV.

DISEASES OF THE MOUTH.

HARE-LIP.

AMONG the deformities which are congenital, is a cleft or fissure of the upper lip, called hare-lip. The defect is not in the mesial line, but a little to one side of it, and extends from the nasal opening to the free border of the lip, constituting an unsightly chasm. The wing of the nose on the side the cleft exists, slides off from its normal position, and appears widened and flattened, adding somewhat to the deformity.

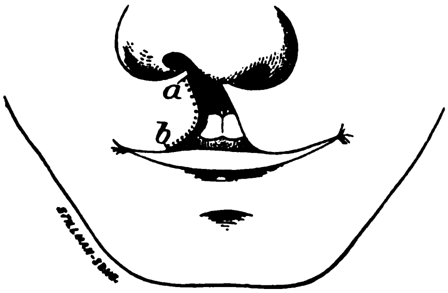
A double variety of hare-lip is not uncommon, a fissure extending to each nostril and having associated with it a cleft in the hard and soft palate. Double hare-lip frequently has, in the mesial space, a projection of bony structure, irregularly covered with integument, which corresponds to the pre-maxillary bone of the inferior animals. Either variety of the deformity is strikingly noticeable, and prevents perfect enunciation.

The cause of hare-lip is unknown, but may be ascribed to arrest of development or defect of evolution. Mothers of children affected with hare-lip, say that during pregnancy they saw an individual thus deformed, and became impressed that their expected offspring might be similarly imperfect. Mr. Chance in his work on "*Bodily Deformities*," while speaking of the causes of monstrosity, very pertinently says: "I fear that the good effected by the Royal Orthopœdic Hospital is more than counterbalanced by the thousands of cases of deformity which, if the vulgar opinion be correct, must have resulted from the collection of so many deformities together, and their consequent exposure to the sight of the numerous child-bearing women attending every admission day, who can not fail to have their attention especially directed to the more severe cases around them. However, I have been attached to this Hospital seventeen years, and yet, during all that time, I never heard of a single case that was *even reported* to rise from any thing occurring, or that had been seen, at the Hospital."

The age most suitable for performing a hare-lip operation, is when the child is three or four months old. This is previous to teething, and after the tissues have acquired sufficient firmness to undergo incisions and to maintain sutures. Some operators advocate joining the fissure a few hours after birth. Although successes may attend such early performed operations, the time seems unreasonably early. It will do to operate when the child is about a year old, or at any subsequent time, though it is best to restore the lip to a normal state before speech is damaged by the long continuance of the defect.

Considerable blood escapes into the mouth and throat during the operation, therefore it is not generally judicious to employ chloroform, as the anæsthetic state favors suffocation. The pain is severe for a few minutes, but not so excruciating as to demand anæsthesia.

FIG. 128.



Single hare-lip; the dotted line from *a* to *b* represents one side of the fissure as having been scarified: the other side of the fissure is to be freshened by making two flaps, *e* and *d*, figure 129.

The child, if the patient be such, is to be prepared for the operation by having a towel pinned around the chest, including the arms in the envelop to keep them from interfering with the operation. An assistant takes the child into his lap, and confines the patient's legs between his own limbs. He can thus secure the child's body and lower extremities in a state of control, and have the elbows to steady the patient's sides, and the hands to hold the head and compress the facial arteries where they pass ower jaw in front of the masseter muscles. The mother of ittle sufferer should be out of sight and hearing, as maternal athies might lead her to interfere with the operative pro- re.

ery thing being in readiness the operator proceeds to freshen orders of the fissure, and to join them with pins or sutures. al plans, more or less ingenious, have been devised to make peration as near perfect as possible; but as several descrip- serve to confuse, I will describe only that which I usually v.

a case of single hare-lip, I pare one side of the cleft, indi- by the dotted line from *a* to *b*, taking off all the red border; I freshen the fissure in the bottom of the nasal opening. next thing to be done is to make a wedge-shaped flap (*c*) in posite border of the cleft, and finish the freshening part of peration by making another wedge-shaped flap (*d*), begin- its apex where the other commenced, and cutting down- s and a little outwards, so the base shall be in the free margin e lip. The flaps are now to be incised underneath, or freed bony attachments; the upper flap gets its supplies through ase near the nasal septum, and the lower flap through its in the prolabium.

FIG. 129.

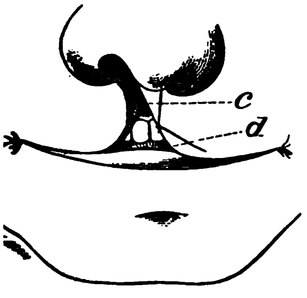
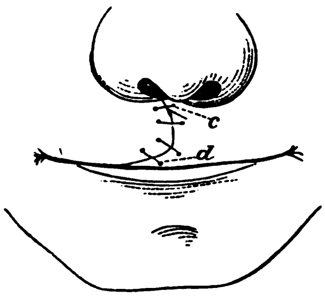


FIG. 130.



ap *c*, in fig. 129, is to be turned upward, to fill the chasm in the nostril; and the flap *d* turned downward to cover the receding angle of the lip on the other side of the fissure. 130 the flaps are *in situ*, and the edges of the fissure are joined with sutures.

e upper and shorter flap is to be turned into the nasal chasm m a floor to the nasal opening, and to occlude the unsightly hich extends into the nose. The traumatic surfaces of the in contact with the abraded floor of the fissured nostril ge of the cleft first freshened, but not to the latter until the border of the denuded lip has been dragged toward the mesial line with a suture. But before any sutures are used, a bistoury is employed to separate the fissured upper lip from the bone beneath, the knife being also carried upward and outward to free the wing of the nose, which slides off too far to correspond with its fellow on the opposite side. To bring the nose into sightly shape is a legitimate part of the operation.

The parts to be joined by the healing process are to be held in apposition by means of silver wire sutures, which may be introduced with the aid of Glover's needles, or the ordinary surgeon's needle. The wire should be as small as an ordinary thread, and drawn from virgin silver. The sutures should be of the interrupted variety, and be placed a third of an inch apart. The needle should be introduced rather deep, and at a moderate distance from the border of the fissure, so that the sides of the walls of the chasm may be drawn together without risk of sutures tearing out. The upper suture should be inserted first, the middle next, and the lower afterwards. The upper flap is then to be fixed with a suture, and finally the tip of the lower flap. The sutures are to be fastened by twisting the two ends of each together. Before the first twist is taken the traction on the two ends should be sufficient to draw the edges of the fissure into close contact. The superfluous wire outside the fastenings may be clipped off with scissors.

No adhesive strips or other appliances are necessary to exert approximative force in support of the sutures. In four or five days the sutures may be removed by clipping each loop with scissors, and then removing the wire in such a careful way as not to endanger a tearing open of the wound. As soon as the sutures are removed an adhesive strip should be applied across the line of the recently formed union, to prevent the wound being torn open by the strain produced in laughing or crying. In ten days from the time of operating, the parts need no artificial support.

As soon as the child is operated upon it may be placed to the mother's breast, and allowed to suck, or take nourishment in its usual way. During the healing process care must be exercised by the nurse that no force be applied to the parts undergoing treatment. No arnica, camphor, or other topical remedy need be applied to the wound. The healing powers are very active, and inflammation rarely runs high enough to demand restraining influences.

Double Hare-lip.—In rare instances the fissure is double in its nature, a chasm extending into each nostril. This variety is most likely to be associated with a cleft in the palate, and should be cured before an attempt is made to overcome the defect in the mouth. Quite frequently, in cases of double hare-lip, there is a central projection from the nasal septum, which is covered with integument, and bears two teeth. This corresponds to the pre-maxillary bone of inferior animals. The teeth in the central projection not being pressed upon by an overlapping lip, are apt to stand forward more than ordinary incisors, thus contributing not a little to the unsightliness of the deformity. In fact, these distorted teeth commonly have to be extracted before the double fissure can be closed.

The operation for closing a double hare-lip must be governed somewhat by the nature of the deformity. In a case moderately defective the fissures can be closed without extracting the projecting incisors, and the restored lip will press the teeth back into line. In a bad case the teeth must not only be extracted, but their sockets must be sliced off with bone-cutting forceps.

Fig. 131.

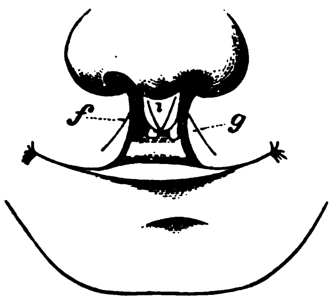
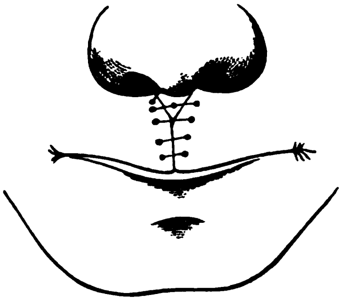


Fig. 132.



The accompanying diagram, when described, helps to convey an idea as to the general plan of operating. A flap is dissected from the outer border of the fissure, the point beginning near each nostril, and the base ending near the edge of the lip. These flaps, *f* and *g*, are to be turned down before the sutures are introduced. The integument of the central piece is to be freshened by incisions which make a short flap on each of its sides, the apex commencing at the point of the central projection, and the base ending in the tissues at the root of the nasal septum. These two flaps are to be turned upward, and made to fit in the floor of each nostril, the chasm where each is to rest having been freshened for its reception. The freshening process is followed by introducing a knife between the fissured lip and the bone, the separating process extending to points under the wings of the nose.

The wound is now ready for the sutures, and the first is to be inserted near the nose, transfixing the central piece in its passage. The next suture is taken lower down, and may or may not hit the intervening wedge-shaped piece. The sutures should be about a third of an inch apart. The lowest suture is through the bases of the two flaps turned down; and the tips of the flaps below the suture are to be trimmed off with scissors, enough being left to constitute the central tubercle which is natural to the upper lip. Lastly, the two short flaps which have been turned into the bottom of each nasal opening, are to be secured in place by delicate sutures. Sometimes they will stay where they are placed without any fastenings. The superfluous ends of the sutures are to be clipped off with scissors near the twists which serve as knots.

No dressing of any kind is necessary. The sutures are to be cut with scissors on the fifth or sixth day, and the loops carefully removed. A piece of adhesive plaster is then to be applied across the line of union to afford some support until firm consolidation is established.

The age for operating in a case of double hare-lip is the same as that in the single variety, and the patient is to be managed in the same way, as well as the hemorrhage.

DEFORMITY OF THE MOUTH.

The oral opening may be contracted, or drawn out of its natural shape by cicatrization following a burn; wounds and ulcerations of the lips may also leave an unpleasant distortion of the mouth. Such deformities are to be relieved by plastic surgery, the operator taking flaps from the immediate vicinity, the cicatricial tissue being first removed by dissection.

CANCROID.—The under lip is exceedingly liable to rodent ulcer, or epithelioma, while the upper lip is rarely, if ever, attacked; but as cancroid is discussed in another place, it need not be repeated here.

FISSURE OF THE LIP.—What is called "cracked lip" is a
ficulty that appears in some individuals every winter, the fis-
re seemingly depending upon the effect of cold winds upon lips
it are liable to tetter. The narrow ulcer bleeds easily, is quite
re when stretched, and remains much the same for weeks and
en months. Cracks or fissures may form at the commissures
the lips, and exhibit all the characteristics of the central fis-
re just described.

The treatment should be constitutional and local. Sulphur
lministered internally makes a favorable systemic impression,
ad so does arsenic in minute doses; while topically the follow-
ig ointment may be used:

℞ Simple cerate, ℥j.
Citrine ointment, ʒij.
Ol. bitter almonds, gtt. iv. M.

APTHOUS ULCERS OF THE MOUTH.—The mucous membrane
the mouth is subject to ulcerative diseases which can not be
iced to any definite cause, except, perhaps, a disordered state
the stomach. Children are more liable to apthous ulcers of
mouth than adults. The disease is ushered in with a chill,
deep pains in all parts of the body. The breath is offensive,
hot, pulse quick, and prostration marked. For such a gen-
morbid state the following prescription may be successfully
loyed:

℞ Camphor water, f℥j.
Hydrochloric acid, gtt. iv.
Sulph. quinia, grs. iv. M.
S. Dose, a teaspoonful every two hours.

ocally, the following wash may be used:

℞ Water, f℥ij.
Salicylic acid, borax, aa. grs. iv. M.
S. Use with a small swab on the ulcers several times a day.

n the management of large and deep ulcers on the inside of
cheeks, it is next to impossible to prevent contractions dur-
cicatrization that will hold the under jaw rigidly fixed against
superior maxillary; and in some instances there may, for
it of motion, follow rigid anchylosis of the jaw. The ulcera-
i, sometimes produced by mercurial salivation, reaches the
rygoid and masseter muscles. At any rate, they become
idly contracted, and the inside of the cheek adheres to the
ms, so that immobility of the jaw depends upon several condi-
ns. If an attempt be made to insert a finger between the

[illegible]
[illegible] take place, and in time
[illegible] possible, if the jaws were
[illegible] tendency to contract would be
[illegible] induced to wear a gag steadily
[illegible] never be determined when it
[illegible] In one case I forced the
[illegible] between the teeth of the two jaws,
[illegible] six weeks; but upon allowing
[illegible] so much contraction took place
[illegible] that had thus been lost. I then
[illegible] molar teeth on the side where
[illegible] the patient endured its presence
[illegible] young woman placed the wedge be-
[illegible] for another year; and at the end of
[illegible] treatment, she had only space enough
[illegible] incisors to insert the fore finger.
[illegible] practical purposes, but I am not
[illegible] that extent of motion. She married
[illegible] I have heard nothing of her since.

[illegible] moved with a screw, is a useful instru-
[illegible] of the jaw by gradual force, or to
[illegible] immobility is overcome by opera-
[illegible] often failed to secure satisfactory
[illegible] cheek from the commissure of
[illegible] three inches, and then dis-
[illegible] this plan sometimes failed.

EPULIS.—A dense tumor of a pinkish hue, growing from the alveolar depth of the jaw, or from the cavity the roots of a tooth have occupied, is called epulis. The growth may be from the isthmus of gum between two teeth, but morbid products of such an origin are polypoid or fungous developments of less significance or gravity than a genuine epulis. During development epulis displaces one or more teeth; and the alveolar process wastes under the pressure of the tumor. As the epulis grows it gets between the cheek and the teeth, and never between the tongue and teeth, for it develops from the outer aspect of the alveolar ridge. If the tumor begins in a tooth-socket, it inclines outward as soon as it gets to a level with adjacent teeth; and it expands the jaw during development, and causes absorption of the spongy structure of the bone.

Epulis may begin in the peridental membrane, for it soon dislodges the tooth with which it is most intimately associated; and if the fang of a tooth remains in the jaw, the disease starts from it sooner than from an empty tooth-socket. A carious tooth does not seemingly become the seat of the disease oftener than a sound one, though Billroth asserts that epulis is sarcomatous, or carcinomatous, and springs from carious teeth or the osteal lining of the alveolus. In one case that I excised before the tumor was larger than a pea, I discovered in the mass removed the lower end of a tooth-fang, and to its tip the pedicle of the tumor was attached. Inasmuch as epulis is always curable by complete excision, I do not regard the disease as malignant. The tumor is not sensitive, unless its surface becomes ulcerative through pressure, injury, or prolonged irritation; and the discharge, in such cases, is offensive and quite profuse.

It is probable that the application of chloride of zinc would destroy epulis, yet the mouth is not a convenient and safe place to use such an escharotic. As the tumor has a basal attachment deeper than the gum there is little gained by excising the growth with a knife or scissors. Epulis must be entirely excised or it will surely be reproduced. If connected with the root of a tooth, or with a fang-socket, the alveolar ridge must be excised in order to include the seat of the disease. I do not think there is any necessity for "sawing out a piece of the jaw," as advocated by Gross. To go to the bottom of the tooth sockets, or a trifle lower, is deep enough; and then there is a firm part of the jaw left. I use a pair of long and strong bone-cutting pliers, are shaped somewhat like forceps for extracting molar teeth. The beak has length enough to cut as deep as the roots of the teeth extend, and the long handles afford leverage great enough to enable the operator to take out a segment of the alveolar ridge with considerable ease, whether operating upon the lower or upper jaw. The operation can be executed through the mouth as readily as a tooth can be extracted. One of the precautions is not to be so rough in exerting force as to endanger fracture of the jaw. I do not use a knife to incise the gums, but cut the soft tissue with the pliers that are to excise the bone. Should the tumor project so far as to be in the way of the grasp of the pliers its top may be cut away to the level of the crowns of the teeth. The hemorrhage will not amount to much. After cutting away a segment of the alveolar ridge and the tumor, with the cutting pliers, I have used the gouge-forceps to deepen the wound in the bone at a point where the epulis is likely to strike deepest. Two or three teeth are often suspiciously involved, especially when the tumor is elongated at its base. Dangerous bleeding is never to be apprehended as the excising pliers mash the vessels. The wound heals readily, and if the epulis be entirely removed, nothing will ever be seen of it again.

ABSCESS OF THE ANTRUM.—The roots of the teeth in the upper jaw penetrate to the great maxillary sinus or antrum of Highmore, and an ulceration or carious fang might easily produce a collection of pus in that cavity, and be called "abscess" of the antrum. Tooth-disease is generally the cause of purulent collections in the antrum; and the symptoms which indicate the presence of pus in that cavity are those of an acutely inflamed and ulcerated fang in any part of the jaw. There is pain in the face, swelling of the cheek, sensitiveness of the teeth in that region, rigors, fever, and prostration. In aggravated cases the palate is tender, the nostril on that side closed, and the eye protruded.

The treatment consists in evacuating the pus; and this may be done by extracting the carious tooth, and perforating the antrum from the bottom of one of its fang-sockets, an awl, small trocar, or slender perforator of any kind being used to establish an opening between the antrum and the fang-socket. In some instances the extraction of the tooth is all that is necessary, for the fang may reach the cavity of the antrum. If no tooth appears to be carious the first molar should be sacrificed

If the disease be left to itself the pus may find its way through the natural opening into the nose, or create an aperture into the mouth by the ulcerative process. Occasionally a fistulous opening is made through the cheek.

DISEASES OF THE TONGUE.

TONGUE-TIE.—A child is occasionally born which has a frænum extending to the end of the tongue, or one that is too short. The consequence is that the infant does not nurse easily—possibly the tongue can not be made to protrude enough to reach upon the nipple. I have found the frænum so short in adults that the tongue could not be protruded from the mouth, yet such individuals could talk without impediment. The cure consists in dividing the frænum. The operation is easy of execution. A spatula is employed to elevate the end of the tongue while the frænum is snipped with scissors. The operator should remember that the ranine artery is not deep in the substance of the tongue, and might be divided if the scissors were allowed to cut into the lingual organ. Only a few drops of blood are ordinarily lost.

RANULA.—A swelling beneath the tongue is called ranula, and arises from obstruction and dilatation of Wharton's duct. The tumor is livid-blue, and fluctuates when pressed with the finger; and when opened, a transparent, jelly-like fluid escapes. In two instances I have found phosphatic concretions in the tumors. In one instance the calculus was as large as an ordinary sized cherry. After the removal no concretion ever formed again. I have found that ranula sometimes is constituted of cysts, containing a fluid of the consistence of white-of-egg. There may be a group of cysts, and the disease is not cured until the last one is removed.

GLOSSITIS, or inflammation of the tongue, becomes dangerous when the organ swells enough to encroach upon the pharyngeal space, threatening suffocation. The disease arises suddenly, and often without apparent cause. The breath of the patient becomes fœtid, and profuse quantities of saliva dribble from the mouth. Deglutition being painful, the presumption is that the tonsils and the pharynx are invaded by the inflammatory action.

The treatment of glossitis is not to be heroic, unless swelling of the tongue be so great that death from suffocation be imminent. The condition of the mouth and throat prevent the ac ministration of medicine or the partaking of food and drink. The disease is sudden to attack, and quick to subside, so that a sufferer is not likely to die of starvation before a subsidence of swelling allows food to be taken. If in any case the swelling be so great that suffocation seemed to warrant extreme measures, tracheotomy might be performed. Deep incisions made along the upper side of the tongue are justifiably made to relieve an œdematous state.

ULCERATION OF THE TONGUE.—It is common for children to have small ulcers form on the edges of the tongue. The ulcerative state probably proceeds from deranged conditions of the stomach. Occasionally these "canker-sores" on the tip and borders of the tongue exist in common with ulcerative patches in the mouth and fauces. A poison invades the body, or is developed there, which produces a chill, high fever, pains in the bones, and great physical prostration. In a short time ulcers thickly appear in the mucous membrane of the mouth and throat, when the pain and febrile symptoms subside. The breath becomes extremely offensive, aud minute blisters appear on the lips and wings of the nose. The general treatment consists in administering an anodyne to relieve the pain, and aconite to subdue the fever. Locally, ulcers on the tongue, whether they be simple in their nature, or complicated with a systemic infection, are to be wetted or swabbed every few hours with the following wash:

℞ Water, f℥ij.
Borax, salicylic acid, aa. grs. iv. M.

It is astringent, cleansing, and promotive of healthy action.

Syphilitic ulcers of the tongue are exceedingly common and obstinate. The sores usually form along the borders of the organ, as if produced by an irritative action coming from the teeth. Their treatment locally should be with the wash prescribed for simple ulcers; but for the systemic contamination general antisyphilitics indicated in another place should be employed.

BENIGN TUMORS OF THE TONGUE.—It is not common to meet with a benign tumor of the tongue. The encysted form of disease is occasionally found. Dr. J. Mason Warren, in his *Surgical Observations*, page 93, mentions a case which was taken to Boston for removal. Dr. Hooker was the physician mentioned, and I was his student. The author says: "Oct. 12, 1847, a physician of Worcester brought to my house a patient with a tumor on the end of his tongue. It was about as large as a filbert: on the tip was an ulcer the size of a pea. The tumor was first noticed seven weeks before, and the ulceration two weeks. There was no pain nor tenderness.

"Passing a pointed knife behind the tumor, I made an incision around the left side, when the pressure of the knife caused the escape, through the ulcerated aperture, of a solid red substance like a small cherry. The operation was completed by an incision on the right side, by which a cyst was removed, with a small portion of the tongue.

"The cyst resembled those so frequently met with in the substance of this organ. The solid tumor appeared to be organized, and not malignant; yet its connection with the enclosing cyst must have been very slight, as a moderate pressure expelled it. A stilet was employed, and the patient went home the same day."

In 1860, Mr. Hogan, of Kentucky, came to me with a lump as large as a marble in the middle of the tongue, an inch from its tip. I made an elliptical incision on each side of it, then seizing it with long-toothed forceps, I dissected out the morbid mass, which proved to be of fibroid character. The hemorrhage ceased in a few minutes, and the wound healed kindly. The man has had no difficulty of the tongue since.

I once removed a benign tumor of the cystic variety from the end of the tongue, by seizing the organ with lithotomy forceps, and then cutting with scissors a wedge-shaped piece from the end of the tongue, the tumor being included in the part removed. A brisk hemorrhage followed, but soon stopped after the walls of the wound were held in contact. No suture was employed, and the parts healed without leaving a notch. As a rule, in similar cases, I think no sutures should be used. If the hemorrhage prove persistent, and one or more sutures will hold it in check, there is a good reason for employing them.

Cancer of the Tongue.—Malignant disease of the tongue may develop in the tip, the body, and the root or base of the organ. The epitheliomatous variety alone is curable. The carcinomatous form of the disease is about sure to result fatally sooner or later. In the advanced stages of the malady the condition of the patient is deplorable. The pain is severe, deglutition is difficult, and profuse and fœtid saliva dribbles from the mouth continually.

The treatment for the epitheliomatous variety is to destroy the morbid mass with chloride of zinc, the salt being applied through a glass tube that is pressed so firmly against the tongue that the escharotic can not reach the cavity of the mouth. After the caustic has lain a few minutes in contact with the tumor or ulcer, the tube may be removed, and the liquefied zinc quickly and carefully wiped away. This operation is to be repeated every day for a week or until a slough forms, and shows signs of coming away. After the morbid mass has been removed, the cavity of the wound may be wetted daily with a weak solution of chloride of zinc until the ulcer has healed. And for several months the patient is to take acid solution of iron one day, and Fowler's solution the next; the medicines seemingly exert the best influence when thus given on alternate days.

In the carcinomatous form of the disease little can be done with hope of substantial improvement. In a favorable case for excision, a considerable portion of the tongue may be removed with the ecraseur, without danger from hemorrhage. Caustics can not be safely used on large surfaces within the mouth and throat; and the actual cautery is rarely admissible, and never does much good. A solution of salicylic acid employed upon ulcerated surfaces will keep down the fœtor. When the pain is excessive in parts of the tongue supplied with sensation by the gustatory nerve, an easily executed operation will afford relief. A curved bistoury is carried to the bottom of the sulcus which exists between the side of the tongue and the under jaw, as far back as the last molar tooth, and then its point made to cut the nerve in its groove in the bone just below the root of the tooth, by pressing the edge of the knife against the jaw and dividing what soft structure there may be in its way. The wound is insignificant, and the nerve is sure to be divided. as may be known by the cessation of pain.

THE TEETH.

Dentistry has become a science which covers the surgery of the teeth, extending upon ground never contemplated by the older chirurgeons. The dentist plugs carious teeth, and makes false sets which are easily worn, and that answer excellent purposes. An old person who has lost the teeth can not talk easily and enunciate properly without a substitute for those which are gone. And it is a fortunate circumstance that the skillful dentist can fit upon the alveolar arch a single tooth, two or three in a group, an upper or lower full set, or a double set, all of which can be removed at night, or at pleasure, and re-inserted at will. The false teeth are usually fastened to a gold or vulcanite plate or palate, which is so constructed that it stays in place by atmospheric pressure.

When the first set of teeth erupts, the child is from six to fifteen months old; and this dentition is usually attended with pain in the alveolar processes, gums, and adjacent parts, and with great systemic disturbance. The stomach becomes sensitively nauseous, the bowels loose, the head hot, the abdomen protuberant, the flesh wasted, the breath fœtid, the brain irritable, the lymphatic glands enlarged, the skin wrinkled and leathery, the eyes lustreless and sunken, the strength diminished, and every organ and function disturbed. The child rubs its gums with its finger or fist, manifests pain in the jaws, and worries almost continually. Meningitis and convulsions threaten. Under such a general morbid state, it is difficult to perceive the most available point to attack. The stomach and bowels claim attention, therefore those agents that favor digestion are suggested. But no great progress can usually be made until the swollen and aching gums have been freely incised. The finger finds where the budding teeth are pressing hardest, and that is the place to use the gum-lancet. The pain attending the insignificant operation is slight, and only a few drops of blood are lost. In many instances the relief is so prompt and substantial that the child may drop to sleep in a few minutes. In several cases the worn out infant has dropped into such a profound sleep after the trivial yet much needed operation, that the mother has taken alarm, and sent for a medical opinion in regard to the cause of the heavy and prolonged sleep, the suspicion being that a stupefying drug has been administered.

After the gums have been successfully incised, the wounds may unite again in a few days, and leave the tension over the erupting teeth as great as ever, therefore a repetition of the incising operation may be required. I have repeated the operation several times, and always with more or less relief. The depth of the incisions should be great enough for the instrument to reach the teeth. Repeated cuttings do not make the cicatricial tissue more difficult for the tooth to get through, but easier if anything. A bistoury should not be used to cut gums lest the point be broken off against the teeth.

far back that the coronoid process of the lower jaw is enc upon, causing pain; and the soft tissues get squeezed b this process and the dens sapientiæ of the upper jaw. O ally an operation or extraction may be required to effect

The alveolar processes are two osseous plates, between are the sockets of the teeth, bony partitions extending from plate to plate, and contributing to the firmness of th The alveolar processes begin to grow with the teeth— pace with them as they develop, and falling away or disap after the teeth fall out. A collection of calcarious matter the neck of the tooth, pushes away the gum, and leads displacement of the teeth by wasting of the fangs, and absorption of the alveolar processes and sockets.

A tooth is composed of two substances,—enamel an The enamel is that dense, polished, outside shell whose h resists the sharpest saw and only yields to the file. The is thickest on the cutting edges and grinding surfaces of and gradually becomes thinner on the sides and as it app the neck of the tooth. When the enamel cracks, acri reach the bony part of the tooth and provoke a carious The inner or bony structure of a tooth is denser than osseous material, but not as hard as the enamel. It decomposition in the earth longer than any part of the or A tooth in all its parts is permeated with vascular can nerve filaments, though neither can be fully demonstrate enamel.

Every tooth has an internal cavity which opens at the carious opening in a tooth is likely to cause pain, especially n exposed to the contact of acrid fluids, cold water and chilly ls. The enamel becomes discolored where it surrounds a us aperture in the tooth; and when no pain discovers the tegrating process, the dark stain reveals the work of decay. des, a disagreeable fœtor usually taints the breath of a person ng a carious tooth.

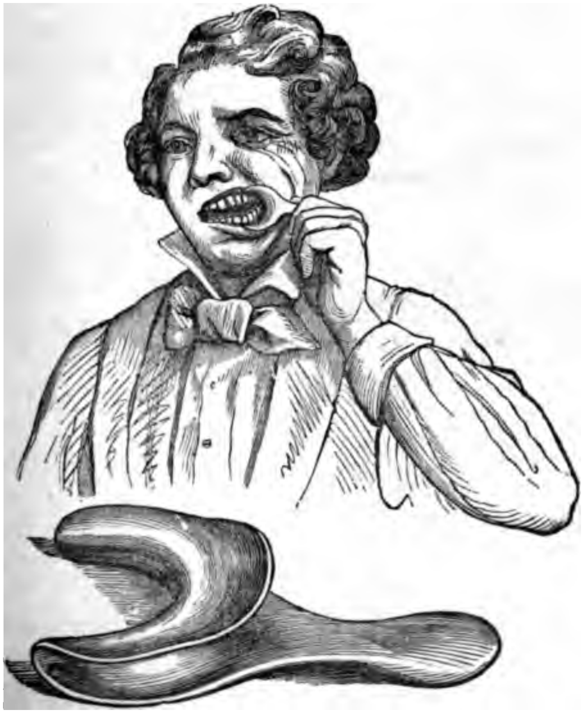
dontalgia may be commonly overcome by stuffing the aching y with the following compound:

℞ Chloroform, fʒj.
Laudanum, fʒss.
Tannic acid, camphor, aa. ʒss. M,

S. Crowd a small quantity into the tooth's carious cavity.

ste made of arsenic or chloride of zinc, and forced into the y of a carious tooth, will destroy the nerve, so that it will r ache again; yet the disintegrating process will go on, and me the tooth will crumble and disappear.

FIG. 133.



Oral speculum.

Pain along the alveolar arches may be allayed by applying great heat to the sides of the face, and by rubbing the gums with camphor, aconite, chloroform, oil of cloves, and various stimulating and anodyne substances. Almost every old woman knows of a famous tooth-ache cure. A sudden attack of "cold" is apt to arouse pain in sensitive teeth.

Ulcerated fangs often terminate in small abscesses—gum-boils, near the roots of the teeth; and the sufferer has a repetition of the difficulty every few weeks or months, until the cause is removed. Puncturing the gum to set free the pus may afford some relief. Ulcerative fangs are generally obstinate difficulties; and a dentist is not justified in the insertion of an expensive filling while ulceration at the root of the tooth is kept up. It is commonly judicious to extract, and not attempt to plug, a tooth with an ulcerated fang. However, I have known the cleansing and plugging of a carious cavity to arrest ulceration going on at the fangs.

Every city and large town now embraces a dentist, therefore a physician has comparatively nothing to do with diseases of the teeth, except to cut gums at the first dentition, and to prescribe something for tooth-ache. But so many of my readers practice medicine in rural districts where no dentists are near, I have deemed it a duty to write a short article on the subject of

TOOTH EXTRACTING.

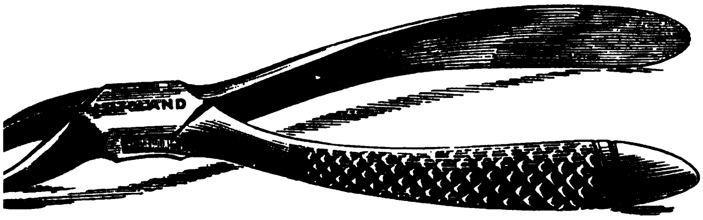
A dentist has a great variety of forceps and other instruments for extracting teeth, yet the country physician endeavors to get along with two or three pairs of forceps. The dentist has forceps fashioned for removing incisors, others for cuspidates, then others for bicuspids, and still others for molars; and, indeed, special instruments for upper and lower teeth, as well as for peculiar shaped teeth, and for fangs. Lastly may be mentioned elevators, turnkeys, and other contrivances for displacing teeth and fangs. And even with all these aids and helps, the experienced dentist occasionally is unable to clear a jaw of teeth and fangs. What, then, may be expected of a comparatively inexperienced physician, who has only three or four pairs of forceps for extracting every form and size of teeth that need extraction? If half the teeth subjected to his hand be not broken, with the fangs left in the jaw, the patients are fortunate.

The teeth of some individuals are very brittle, and will con-

ently break under the grip of the forceps, unless the opera-
ets a good hold below the fragile part of the tooth. The
t of success in extracting teeth is to get a good hold before
orce is applied.

fore an attempt is made to extract a tooth, a thorough explo-
n of the mouth is in order. The speculum oris is useful to
the oral orifice so the teeth may be viewed in a good light.
all blunt hook, such as is used in raising the tendon to be
ed, in an operation for overcoming strabismus, may be em-
d to explore a tooth that presents a diseased appearance.
lunt point finds tender places and carious apertures. With
depth of a cavity may be determined, and the strength of
oth estimated. If a tooth be hollow to a point beneath the
and weak part of the tooth, the beaks of the forceps must
de to displace the gum on each side, and to cut through
ges of the alveolar processes before the grip is given which
seize the tooth beneath its brittle and decayed parts. It is
ally a useless practice to incise the gums on each side of a
before the extracting instruments are employed. The beaks
e forceps are made wedge-shaped for the purpose of displac-
he gums from the teeth.

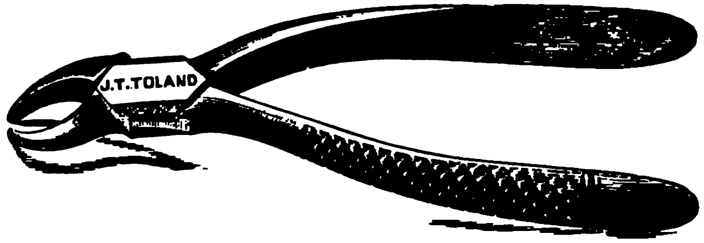
FIG. 134.



order to conform as nearly as possible to an economical
of tooth-extracting instruments, I would say that four pairs
rceps embrace the smallest number that can be got along
in ordinary practice. A pair of forceps with narrow beaks,
lightly curved, will do to extract the front teeth of children,
incisors, and certain fangs. Straight forceps are commonly
yed for extracting both upper and lower incisors, but the
rately curved beaks, represented in the diagram, will answer
y good purpose, the operator accommodating his position,
hat of his patient, to the easy application of the instrument.
hile the operation of extraction is going on, the patient's

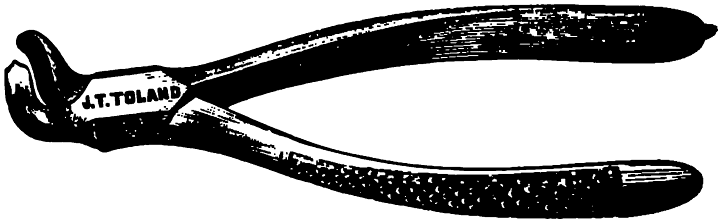
head should be held in a steady position. The forceps should be made of good stock, and so tempered as not to bend or break under the force ordinarily applied to them. The inner surfaces of the beaks are made slightly concave so as to clasp the cylindrical form of a fang or the neck of a small tooth; and the beaks should be slender enough to easily slide between the gum and tooth, even down to the alveolar crests. It may be necessary to incise over-lapping gums when a fang is to be extracted; but it often requires as much resolution on the part of the patient to have the gums incised, as it does to meet the forceps.

FIG. 135.



The accompanying diagram represents a pair of forceps, whose strength and beaks are adapted to the extraction of the superior incisors, the cuspidati and bicuspidate teeth, and the larger teeth of children. The variety of teeth to be removed by this instrument renders it impossible for the blades to accurately fit all of them. This instrument is, consequently, to be applied and used with the greatest care to prevent untoward accidents. The breaking of a tooth in an attempt at extraction, is particularly to be avoided. If the inside of the beaks be too concave, the instrument will break off the neck of the tooth; and if they be too near a plane surface they may crush the crown of a frail tooth. Such accidents often occur from badly fitting instruments.

FIG. 136.

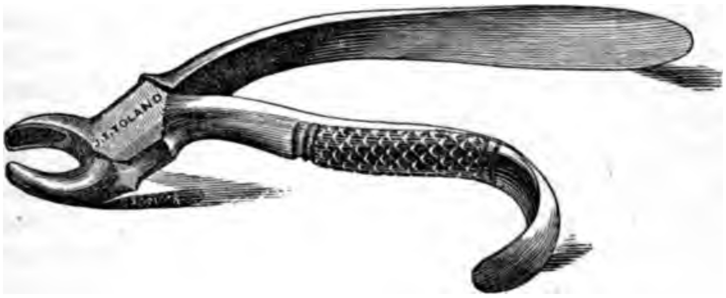


The cut represents a pair of forceps which may be employ
for the extraction of the inferior molars, including the wisdo

teeth of the lower jaw. In place of this a practical dentist is accustomed to use at least three pairs. One instrument, fashioned as indicated in the diagram, in good hands, will remove the teeth just enumerated. To use the instrument advantageously the operator should stand on the right of the patient, behind his arm, and facing his side. The patient's head thrown back, to bring into view the teeth, is to be held firmly with the left *arm*, while the left *hand* steadies the jaw to prevent fracture or dislocation. It is essential that the operator stand upon a stool, unless the patient be placed upon a low seat. Without this precaution many teeth might be broken that with it could be entirely removed at the first trial. The blades of the forceps must be well arched on their inside, or the crowns of decayed teeth will be crumbled by their pressure.

None of the forceps previously mentioned are fit to extract upper molars, consequently one adapted to that purpose remains to be described.

FIG. 137.



The diagram represents it, and shows it to be a more powerful instrument than either of the others. It has a curve in it near the joint, to let it back into the mouth; and at the same time it gives the operator control over these triple fanged and firmly set teeth. That the hand may exert more power upon the handles of this instrument, a curve is made in one of them to wind around the little finger. The instrument is well adapted to the extraction of the superior molars and the upper wisdom teeth. The patient while these forceps are used, should be placed on a low seat, or the operator should be elevated. It needs great power in the hand to prevent the beaks from slipping from a tooth. When once grasped, the tooth should be strongly canted in and out, to loosen the deep set fangs, but short and repeated cantings are painful and useless.

With four pairs of forceps, fashioned somewhat like those represented in the diagrams, the physician can extract any tooth that demands the operation. The first and second are nearest alike, therefore if the set be reduced to three pairs, one of these, or a compromise form of the two, is to be selected. They were originally devised by the late J. T. Toland, and called the *physician's set.*

The turnkey is an old style of instrument, and still occasionally used to dislodge a tooth which is decayed to the gum on one side: and for that purpose the clumsy hook and lever find a place in almost every dentist's operating case.

EXSECTION OF THE UPPER JAW.

Necrosis of the superior maxillary, tumors of the antrum, and cancerous growths in the upper jaw, call for removal of the bone, wholly or in part. Either of the diseases named is attended, in its development, by pain, swelling, and the usual phases of inflammation, together with considerable distortion of the features of the face. Necrosis usually begins in the alveolar process and extends upward until a great part of the bone is involved. The fragment of an old fang in its socket may be the provoking cause of the dying process in the bone. Considering the frequency of disordered and dead fangs, and the intimate connection of the roots of the teeth to the maxillary sockets, it is strange that necrosis of the jaws is not more prevalent than it really is. Those who work in phosphorus are exceedingly liable to caries of the jaw.

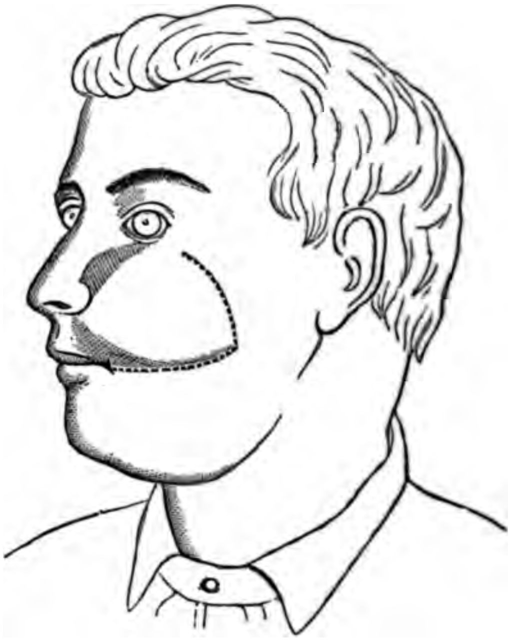
When the superior maxillary is becoming necrotic, there will be discharges of pus into the mouth and nose through sinuses, and the soft structures of the cheek will be red, tender, and swollen. In some instances the pain is excruciating. The general health of the patient is disturbed by the extent and gravity of the disease, so that it seems urgent that the disturbing cause be removed. If only the alveolar ridge be necrosed, the gouge-forceps may be used to cut away the dead bone, the knife having previously dissected away the soft covering.

Tumors of various kinds, including the malignant variety, are apt to develop from the lining membrane of the antrum; and in their development they encroach upon the nasal cavity, and by pressing the orbital plate upwards, make the eye protrude. The cheeks below the eyes, when the disease is upon both sides, bulge upward and forward, giving a peculiar expression to the countenance that has been called " frog-face." If the disease be malignant, the cheek below the inner canthus of the eye is deeply shaded with a maroon color; and there is a free discharge of a serous, purulent, and sanguinolent fluid from the nose. The disorganizing force of sarcoma and carcinoma is competent to dissolve a great portion of the superior maxillary, leaving little for the surgeon to remove. The antrum fills with medullary matter, and further growth encroaches upon adjacent cavities. The ethmoid and sphemoid cells and sinuses get filled with cancerous matter, and the walls of these cavities break down under pressure and the dissolving processes.

When the disease of the antrum is cystic or polypoid, the morbid action may be restrained by the osseous walls, yet it often exhibits power enough to bend the parieties of the cavity, and thereby distort the features of the face. While the disease is confined to the maxillary antrum, it may not be suspected, though the pain indicates trouble of some kind in that region; and as soon as the thinner bones of the nasal cavity begin to yield, the functions of the nose are distorted. There will be tenderness of the tissues of the cheek, and of the roof of the mouth.

For the diseases named in connection with the superior maxillary and the antrum, the most radical means of temporary or permanent relief consist in the removal of the bone, and such morbid matter as may be connected with it. The operation is somewhat formidable, yet when it is considered that in necrosis the bone is generally loosened at its junction with other bones, it will be seen that little more is needed than to pry the dead structure out of place after its surface is exposed by proper incisions and dissections. When the disease consists mainly in cystic, sarcomatous, and carcinomatous growths, that begin in the antrum and at length distort the face, the exsection of the bone is often facilitated by the dissolving and disarticulating nature of the morbid action, consequently the removal is not so difficult as might be supposed on the part of those who have had no experience with the operation. It is to be borne in mind by the operator that each superior maxillary assists in the formation of three cavities—the roof of the mouth, the floor of the orbit, and the outer walls of the nose; that each superior maxillary bone articulates with its fellow in the median line from the alveolar ridge in front, to the palate bones in the back part of the mou not often required.

FIG. 138.

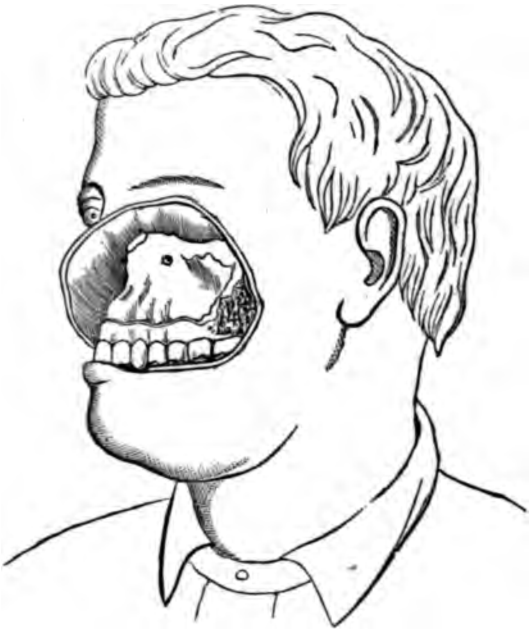


Dotted line shows course of incision to be made in order to expose superior maxill

The patient under anæsthesia, should be sustained in a s
posture, so that the blood will not run back into the throat,
having coagulated, interfere with respiration. Everything
in readiness, the operator takes a scalpel, and beginning an in

and flap are dissected upward until the superior maxillary is exposed as fully as practicable. With bone-cutting pliers the two superior maxillaries are separated in the median line, the division extending from the teeth through a considerable part of the septum between the mouth and nasal cavity on the side the operation is being performed. Gouge forceps may be used to cut away the connection with the malar bone, and to divide the nasal process, the ascending portion being left where it is, unless it be necrosed, and then it will easily come away after it has been divided. In most instances the orbital plate and rim can be left, as they are not apt to be diseased. The gouge or other strong forceps are then made to loosen the partially detached jaw, and an elevator or chisel is employed as a lever to pry the bone out of its place. If the antrum be filled with carcinomatous material it may be emptied with the finger after an opening is made into it with the gouge forceps. As soon as all diseased structures are removed,—and much care should be exercised in this part of the operation,—the flap is to be turned down over the ghastly wound, and stitched in place with silver wire sutures. The cheek, having no bony

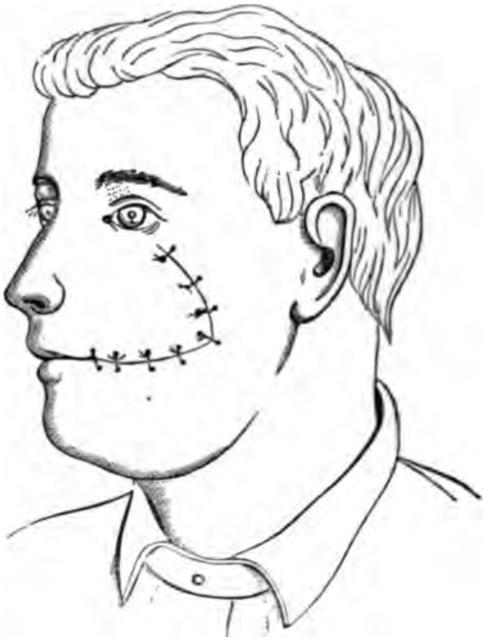
FIG. 139.



Flap of cheek turned up to expose the upper jaw.

support, falls in a little, yet not to a deforming extent. The traumatic surfaces mostly drain into the mouth, and the fluids are then spit out. I have romoved a large part of the superior maxillary bone in six instances, and have never yet been obliged to employ a ligature to arrest hemorrhage. The bleeding is occasionly quite profuse yet never dangerous.

FIG. 140.



Flap of cheek returned and stitched in place.

When the antrum and nose are filled with sarcomatous or carcinomatous masses, it is pleasing to find how easily the finger empties these and adjacent cavities. Sometimes the cells of the ethmoid bone are filled with medullary matter, so that they have to be broken down and removed. The bony walls are so thin that the finger can sweep away cells, sinuses, and their cancerous contents. The operation, in carcinomatous cases, is followed by greatly improved symptoms. The pain ceases, breathing through the nose is re-established, and bodily strength is restored. But, as after most other operations for the removal of carcinomatous growths, the time will come within a year or two, when either a return of the disease to its original site, or its development in some other part of the body, will bring about a fatal termination.

The operation, then, in cancerous cases, is palliative, and not designed to eventuate in a radical cure. Yet, when a victim to the dreadful disease is suffering the most harassing tortures, and an operation will promptly relieve and prolong life, there can be no question about the propriety of performing an operation which in itself is not dangerous to life, and which is not difficult to execute.

When the disease leading to removal of the superior maxillary is not malignant, the chances are that the relief will be radical. In one instance I removed the entire bone, which had become necrosed: and the cure was substantial and permanent. The cheek was inclined to fall in afterwards; and to counteract this the patient used to stuff the chasm with a wad of lint. A dentist proposed to place a gold plate—an artificial jaw—beneath the cheek, but the patient objected on account of the cost.

EXSECTION OF THE LOWER JAW.

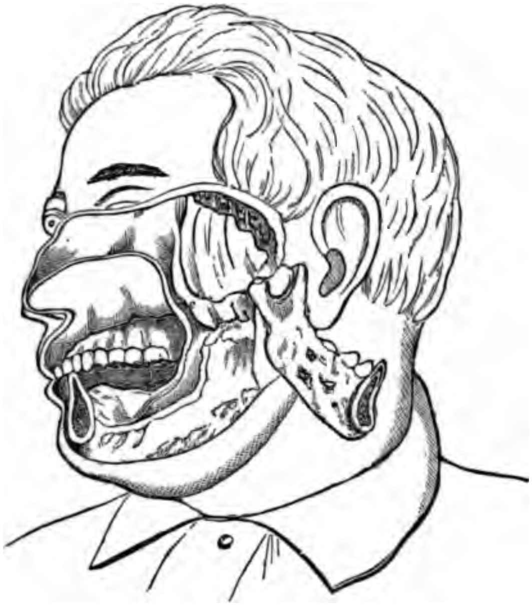
Various diseases of the lower jaw demand a removal of the bone in its entirety or in parts. Necrosis and sarcoma are the two morbid states which oftenest require excision of a part or the whole of the inferior maxillary. Tumors of the alveolar portion of the bone, as epulis, may need a moderate operation for their removal, and such as can be executed through the oral orifice, no external wound being necessary. This is accomplished by the aid of powerful bone-cutting nippers which resemble the angular beaked forceps employed to extract inferior molars, only the handles are longer, for increase of leverage, and the beaks are made for cutting instead of grasping. The ordinary gouge forceps can be used upon a section of the alveolar ridge near the oral opening, but it requires an instrument made specially for the purpose, to cut away the alveolar ridge as deep as the roots of the teeth. In such a case the gum, if it have not retired by the action of the disease, is to be included in the cutting grasp of the forceps, and its ragged edges trimmed with scissors.

When necrosis is confined to the root of a tooth, and produced by the presence of a decayed fang, the extraction or removal of the dead stump may be followed by a cure through the unaided recuperative powers of nature; but when a segment of the jaw an inch or so in length requires removal it is generally best to execute the excision through an external wound made for the purpose. An incision two inches long may be made through the soft tissues along the ridge of the jaw, and, after the elevator or cleaving instrument is used to separate the flesh from the bone, including the periosteum, bone nippers can be employed to excise that portion of the jaw which is diseased. Hey's saw may be used to cut the bone a part of the way, when the gouge-forceps can easily be made to complete the removal of dead bone. The wound is to be closed with sutures, and the chasm bridged with a splint, a bandage over the head and under the jaw being used to support the truncated parts. At length ligamentous bands form from section to section, giving the resected jaw considerable support.

In the event that one half the inferior maxillary needs removing, from the symphysis to the condyle, the operation becomes quite formidable. In all cases, as much of the bone must be saved as possible. If it will do to leave a half inch of bone beyond the median line on the side which is diseased, the muscles of the tongue have a point of attachment which is of value in keeping that organ from descending into the throat and thereby threatening suffocation. In one case I was able to cut across the symphysis obliquely, and thus preserve the attachment of the glossal muscles. If the ramus of the jaw and its processes can be saved wholly or in part, the conservative effort should be attempted.

If the inferior maxillary be necrosed from its symphysis to its condyle on one side, or a sarcomatous tumor necessitates a removal of one half the bone, the cut reaches from the free edge of the under lip to the chin, and along the lower edge of the jaw to the angle, and then obliquely upwards to near the articulation of the condyle. This begins a large flap which is to be dissected clear of the bone, and turned upwards, where it is held by an assistant. This flap takes with it the masseter muscle and offers an opportunity to clear the coronoid process of the temporal muscle, as well as to cleave the internal pterygoid from its attachments to the angle and body of the jaw. The next step is to make a section of the bone at or near the symphysis, when its inside surface may be cleared of all muscular and periosteal attachments. The part of the jaw thus partly freed may be twisted outwards so as to reveal its condyloid connections, and then these joinings may be separated with scissors or the point of a knife. The traumatic surfaces are extensive, and the chasm is large, yet after the facial flap is returned to place, the deformity and mutilation disappear as if by magic. A few sutures hold ap in place, and a bandage around the head and face give al support to the cheek. If at the commencement of the tion, the detachment of glossal muscles at the symphysis is to endanger suffocation by a falling back of the tonge, the the organ can be transfixed with a needle; and a thread, into a loop and used by an assistant, holds the tongue for-

FIG. 141.



Exsection of the lower jaw.

save a notch or cicatrose line in the lip, the incision may nence, or terminate, as the operator may choose, in the lip a inch below its free border, there being room enough to excise one after the flap of soft tissue is dissected up. The silver res which close the wound should be placed a third of an inch t. A dentist will be able to fix a plate of jaw and teeth in of the removed maxillary, which shall keep the cheek from ing to an unsightly degree. The facial artery, as soon as it vided, should be ligated to save blood. The operation is ded with considerable hemorrhage, venous and arterial, yet patient rallies well, and does not seem to be the worse fo loss.

When the entire lower jaw needs removing, the lip is not incised, but the knife is carried along the base of the jaw from one angle of the bone to the other, and then obliquely upwards and backwards, to points near the temporo-maxillary articulations. The bone is then to be divided with a saw and bone pliers at the symphysis, in order to free the maxilla from its connections and articulations with the greater ease. In fact, the operation for removing one-half the jaw, is to be repeated on the other side, when the entire bone is excised.

MAXILLARY NECROSIS FROM THE EFFECTS OF PHOSPHORUS.

Workmen engaged in the manufacture of lucifer-matches are subject to caries or necrosis of the maxillæ. At first a periosteal inflammation is excited, and afterwards the bone becomes affected with disintegration and exfoliation. The tooth-pulp may be the only part impressed with the phosphorus-poison, the bone escaping the destructive influence.

The exfoliation of portions of the jaw-bones is so frequent in the laboratories where lucifer-matches are made, that there no longer exists a doubt in regard to the cause of the malady. Every match-manufactory has a number of victims every year. The poison reaches the saliva by breathing phosphorus-fumes which are condensed into phosphoric acid. It is found that the disease is almost wholly confined to those engaged in *dipping* the matches into the fused and reeking phosphorus-compound, and to others engaged in the *drying* process, the apartments being highly charged with the fumes of phosphorus.

Mr. Simon narrates a case of necrosis of the jaw which occurred in an individual who was in the habit of nibbling pieces of ginger-root which were carried in the pocket with lucifer-matches.

The baneful influence of phosphorus in match-manufactories is not exerted through the blood or fluids of the body, but locally, the poison coming directly in contact with the osseous structures only when an opportunity exists for reaching them, as through the cavity of a carious tooth. Those persons who have perfectly sound teeth are exempt from the disease.

The early symptoms of phosphorus-poisoning are tooth-ache, pain in the head, tenderness and swelling of the gums. At length the patient becomes feverish, and prostrated, and in the course of a few weeks pus makes its appearance beside the affected teeth, and sinuses form which lead to the dead bone.

As soon as an employe of a match-manufactory exhibits signs of dental and maxillary disease he should be prohibited from continuing at his occupation, at least until all carious teeth have been extracted, and the wounds have healed. It has been suggested as a prophylactic that those employed where the fumes of phosphorus exist, should wear veils or textile screens, but no organized plan to that effect has been put in operation. The more experienced workmen have their teeth examined occasionally by a dentist; and as soon as a cavity is discovered it is obliterated with a filling. A loose and elongated tooth is presumed to be affected, and should be extracted at once.

Sequestra of the superior maxilla can generally be removed through the mouth without incising the cheek. They are usually small and in detached masses, while the inferior maxilla not uncommonly dies *en masse*, and has to be removed by dividing it at the symphysis, and dislodging it in halves, or nearly so, the condyle alone escaping necrosis. In the event that the condyles remain sound it is desirable to separate them from the diseased parts without mutilating the face. To do this needs a narrow pair of bone-cutting forceps with long handles that can be manipulated through the mouth. It is hardly practicable to use a Hey's saw or any modification of it so far back in the oral cavity.

The superior maxilla of either side can not be removed without mutilating the cheek about as follows: a knife is carried from the commissure of the mouth in an outward and upward direction until the incision reaches the malar bone, then it is to be extended beneath the orbit to a point an inch from the nose. This flap is to be dissected from the bone and turned over the nose, when an opportunity is given to pry the maxilla out of its place with chisels or elevators. As the ascending process is rarely involved in the necrosis, it may be cut across with bone nippers and left in its place. The dead portion can then be removed without much trouble; the dying process has separated it from adjacent bones. After the removal of the dead mass the flap of cheek is to be turned down into place, and secured there with silver sutures. The semicircular scar is not a serious deformity, and the cheek does not fall in as much as might be supposed. When both superior maxillæ have to be removed the upper lip is not well supported; yet the symmetry of the deformity on both sides of the face is a redeeming feature.

It may be stated in this connection that feeble children ranging from five to eight years of age are liable to undergo necrosis of the alveolar processes of the superior maxillary, especially after suffering an attack of scarlatina or other devitalizing exanthematous disease. Attention is first attracted to loose and painful teeth, but in a short time pus will issue from the alveolar surroundings, and at length a sequestrum is formed. The extraction of the teeth and the removal of the dead bone constitute the treatment. If the disease extend, the affected alveolar ridge must be excised. In the mean time the patient must be well sustained with an appropriate diet, and with iron, arsenic, mineral acids, and bitter tonics. As the pus coming from the diseased bone is always offensive, a solution of salicylic acid should be freely employed upon suppurating surfaces.

CLEFT PALATE.

A congenital defect of somewhat frequent occurrenc consists in a fissure which extends from the tip of the uvula, through the soft and hard palate, to a chasm in the upper lip. In some instances, the defect is confined to the lip; in others to the naso-oral septum; and in many to the velum or soft palate alone.

Persons having cleft palates are unable to enunciate words in sounds that can be distinctly understood, consequently the defect, unless remedied by a surgical operation, is a misfortune of magnitude. Hare-lip is more unsightly than cleft palate, yet it affects the speech less. However, both defects oftener occur in combination than either singly.

Cleft palate is an evil resulting from arrest of development at a period of fœtal life prior to the fourth month. The cause of the derangement in nature's operation is not known, but the fact that young lions born in a state of captivity, especially if their parents and grand-parents have been caged animals, are afflicted with cleft-palates, has led to the supposition that artificial life has something to do with the vital operations which permit a lapse in the organization of the fœtus. It has also been observed that man in a savage state is not often the victim of congenital defects. Perhaps the diminished care bestowed upon defective offspring results in early death, so that only the better forms attain adult life. In a transcendental way it has been argued that the human ovum passes through evolutions peculiar to the development of inferior animals; and that when a defect exists in the human fœtus a halt or lapse intervened at a period when the germ was passing through changes belonging to a prototype. The presence of a premaxillary bone, with distorted incisive teeth, in some hare-lip and cleft-palate deformities, lends some support to this theory.

Fissures of the lip and palate frequently affect more than one member of a family; and a parent having these defects is more likely than others to have children with similar deformities. On the other hand, it can not be positively predicted, when both father and mother have cleft of the lips and palates, that their offspring will be similarly affected. It is presumed, however, that the defect will, perhaps in a modified form, crop out in a lineal descendant of the second or third generations.

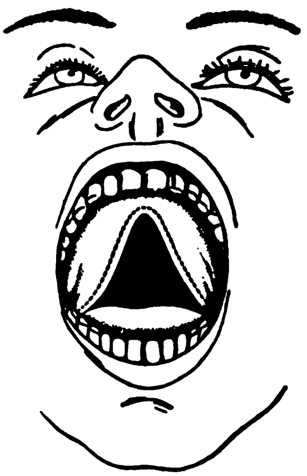
As a rule, the more extended the fissure in the antero-posterior direction, the wider it will be, and the more deflected will be the borders of the cleft. Usually the gap is widest behind, and narrows as it extends forward. The fissure in some cases is quite narrow, though it reach from lip to velum; in others the cleft is so wide, and so little of the soft and hard palate remain, that an attempt to remedy the defect by operative interference, seems unjustifiable.

An infant with a fissure of the lip and palate can not with the tongue form a vacuum in the mouth which is essential for suction, therefore it is liable to die through lack of nutriment, unless fed with a spoon or bottle; and when thus taking nourishment the child should be held almost upright in order that the nutrient fluid may fall downward and backward into the pharynx, and not get regurgitated through the nose.

Inasmuch as surgical interference to remedy a palatal defect, is not advisable until the child reaches adolescence, though a cleft in the lip may be closed at an early age, it is well to have an artificial palate of vulcanite worn soon after there is an attempt to talk, in order to prevent the unpleasant speech which is sure to be acquired when the fissure is left unclosed till puberty. As the mouth grows the artificial palate is to be enlarged from time to time. The part of the artificial palate resembling the velum, is to be made of thin india-rubber sheeting, and attached to the palate which serves as the hard palate. A dentist is to construct and adjust the artificial palates. So great perfection in this art has been attained, that an operation for the closure of the cleft has become a matter of choice rather than absolute necessity.

The joining of a fissure of the soft palate is effected much as is a cleft lip. The borders of the opening are to be freshened, and the raw edges held in apposition with sutures. The freshening may be performed with vesico-vaginal scissors, and with a long slender knife. If scissors be used, one side of the velum is to be held with long forceps, and a narrow strip is to be carefully cut from the bifid uvula to the commissure of the fissure, and then the other border is to be freshened in the same manner, though the operator should be ambidextrous to execute the process with readiness. I generally freshen one side of the cleft-velum by fixing a long tenaculum in the bifid uvula and holding it in my left hand, while with scissors in my right I cut loose the strip which is kept tense with the hook. The patient is to endure the operation without anæsthesia, for the pain is not intense, and the blood might coagulate in the glottis, producing suffocation. Some patients will sit quietly in a chair with the head at rest while the operation is being performed, yet others rebel on account of the choking sensations excited. The tongue is often an ungovernable organ, the movements of which baffle all efforts of the surgeon. It is well for sensitive patients, who have little control over themselves, to titillate the root of the tongue and fauces with the handle of a spoon for several days preceding the operation, in order to accustom the parts to manipulation.

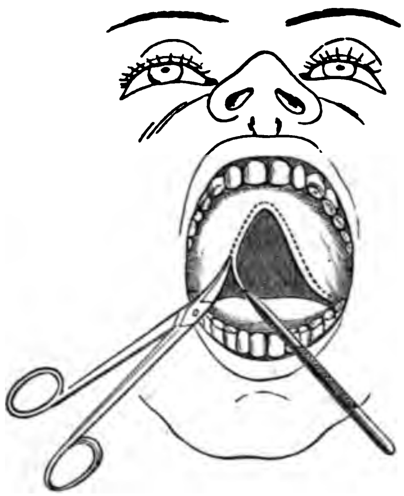
FIG. 142.



Cleft Palate. The dotted line indicates the strip to be taken off in the freshening process.

Another method of freshening the borders of the cleft is to seize the point of the bifid uvula with a long pair of toothed forceps, and then with a slender knife transfix the velum near its edge, and cut each way. A double-edged knife has been employed for this purpose, though a knife shaped like a tenotome, yet with a longer shank, may be made to execute the severance of the strip, the blade being turned after it has cut in one direction as far as necessary. The freshening process is much like that employed in denuding the edges of a vesico-vaginal fistula, and the same instruments can be made to execute the operation.

FIG. 143.

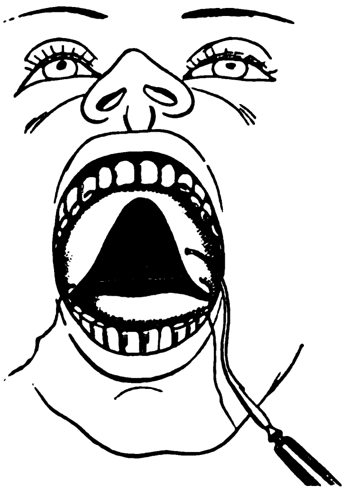


Removing the border of the fissure with scissors in the freshening process.

It is a fundamental rule in plastic surgery, that no traction upon sutures should exist, especially in cleft palate operations; therefore provision must be made to get rid of the tension exerted, by a division of the tensor and levator palati muscles. This may be accomplished either before or after the freshening process, by seizing the edge of the velum with forceps that take a reliable hold, and pulling the flap towards the median line, while a narrow knife just described, is made to transfix the palate near the hamular process, a little in front and to its inner side. The position of the process can be determined by the aid of the finger, which locates it in the substance of the soft palate, internal, and a little posterior to the last molar tooth. The tensor palati winds around the hamular process, and expands in the anterior aspect of the soft palate, therefore the knife can easily be made to divide it near the pulley; but the lavator palati is spread out upon the posterior aspect of the soft palate, and has to be divided by raising and depressing the handle of the knife, so as to make a long incision on the back side of the velum. As soon as these muscles are severed, the forceps convey the impression that all resistance has ceased, and that the edge of the velum can be drawn to the median line without effort. The other side is to be treated in the same way before sutures are inserted.

Some operators begin a staphylorrhaphic operation by inserting a temporary suture through the border of the fissured palate near the base of the uvula, and use it to hold the section tense while a division of the muscles just named is accomplished; one side having been thus prepared, the other is to be treated in like manner. The freshening process is accomplished afterwards. I prefer to pare the edges of the cleft before an attempt is made to sever the muscles. The incisions made in the soft palate to divide the muscles, are so small in front that the healing process will readily close them without sutures. The wounds are like those made subcutaneously to sever tendons.

FIG. 144.

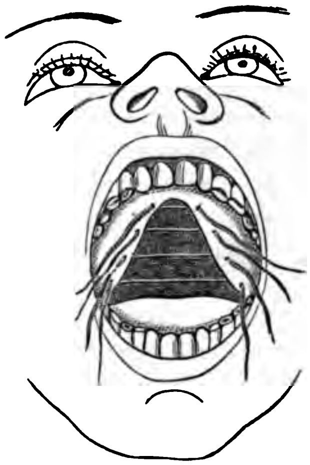


The lower wire suture passed and the suture-bearer on its way to carry the second.

The edges of the freshened cleft are to be held in apposition with sutures, the number depending upon the length of the fissure. Four or five are generally requisite to join a cleft of the soft palate alone. Most operators prefer sutures of silk, and use curved needles which are passed with long forceps, but I can work faster with the curved hollow needle and fine silver wire. Some care is necessary to insert the sutures on the same plane in the two sides of the velum that the edges may be approximated without producing a pucker in the tissues, or an unnecessary strain upon the sutures. I commonly insert the first suture near the base of the bifid uvula, but may not twist or fasten it until all the others are secured. The ends of this primary suture are employed to draw the two sides towards each other, and hold the parts steady while the other sutures are being inserted. The second suture in the order of insertion, is placed near the hard palate, or at the other extremity of the fissure, and secured by twisting the two ends of the wire for a knot. This should be carefully performed, as success in a measure depends upon having the sutures closely or snugly approximate the freshened borders of the cleft, yet not cut through the flesh. Two pairs of forceps may be used to twist the wires into a knot when drawn just tight enough, yet the two forefingers, while the ends of the suture are held in each hand, serve to make the stitch tense, and to fasten it with a twist at the same time; two or three twists are then made, when the superfluous ends may be cut away with scissors. The third stitch is taken about quarter of an inch from the second, and so on to the first inserted, which is the last to be fastened. The bifid uvula may be osed with a single suture.

The wire should be very fine—28 to 30 in size—and made of irgin silver. If the hollow needle or suture-bearer be used, it an readily be made to pierce one border, then the other, without etracting, re-inserting, etc.; in other words, the suture is passed through both borders by a single effort. The ends of the wire can be fastened by twists quicker than a knot can be tied in a silken suture. Indeed, it requires nice manipulation to tie the two ends of a textile suture in the depth of the mouth. While every part of the operation is undergoing execution the patient is to be seated so as to rest the head, and at the same time to let a good volume of light into the mouth. A mop constructed by binding a piece of sponge to the end of a stick, is to be used to absorb and wipe away blood and saliva during the operative procedure. The patient is to restrain inclinations to swallow and to spit as much as possible.

FIG. 145.

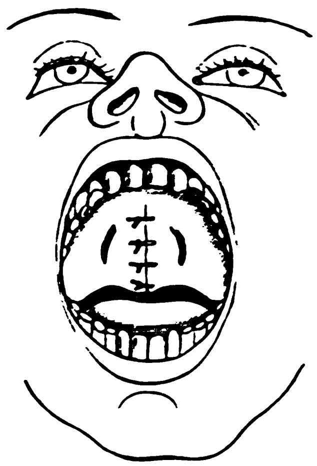


The sutures all passed and ready to be tied.

After the operation is complete the pain and discomfort are not severe, though a sense of drawing or tension in the palate will be felt for two or three days. The sutures are to be snipped and carefully removed on the seventh or eighth day; and while they are in place and for three or four days afterwards, nourishment in a liquid state alone is to be taken; and even that should pass into the pharynx without effort of the mouth and fauces. Cream, jellies, and custard should constitute the diet. The patient should have a handkerchief passed under the chin and tied over the top of the head, to keep the mouth closed while asleep. The tongue is thereby somewhat restrained in its movements, and sudden twitches in the muscles of the face, mouth, and throat are prevented. Gaping is also obviated by the handkerchief dressing. The patient is not to allow the tongue to feel of the suture-fastening, or to try the tension of the velum. Coughing, sneezing and hawking, should be kept under rigid restraint, lest a temporary strain be put upon the velum. Attention to these seemingly small matters is as important as the different steps in the operative procedure.

When fissure of the palate is not confined to the velum, but extends through the roof of the mouth, and perchance the upper lip, a single operative procedure is not enough to close it. Either the cleft in the soft palate is to be closed first, and the oro-nasal fissure afterwards, or *vice versa.* It is too much for a patient to endure, if the entire closure be attempted at one sitting; and the risks of a cure are increased when a great deal is undertaken at a single operation. Besides, if the soft palate be operated upon successfully, the fissure in the hard palate is converted into a foramen whose borders have increased vascular supplies; and the same point is gained when the hard palate is cured first, for the velum will be the better circumstanced for receiving nutritive support.

FIG. 146.



Fissure closed, and incisions to relieve strain on sutures brought to view.

Fissure of the hard palate is rarely in the median line, but often runs near the alveolar process of one side or the other. At the borders of the fissure the oral and nasal membranes blend; therefore to obtain flaps to cover the chasm in the bone, the oral membrane must be dissected from the hard palate for some distance in order to secure elastic material which can be made available in the attempt at occlusion. A knife with the blade bent at or near a right angle with the shaft, can be used in the dissecting and cleaving process. The point of the knife is to be kept close to the bone in order not to perforate or bruise the flap which is being raised. A sharp knife is needed to split the oral and nasal membranes along their line of union, but a duller one may be employed to dissect up the flaps. The flap detached from the bone consists of mucous membrane, connective tissue, and periosteum. The extent of the flaps should be great enough to allow their edges to come into apposition without tension. If it be found that traction is required to approximate the edges of the flaps, the knife must be used to widen the flap or to free an adhering band. After the flaps have been secured by dissection, their edges, though fresh, should be straightened or evened, and made fit to unite without a chance of failure. If an unfreshened mucous surface folds in, and thus becomes an insuperable obstacle to union, the operator alone is responsible for the bad result that will surely follow. The sutures are to be inserted within a quarter of an inch of each other, and may be either silk or silver. In complete fissure of the hard palate the edges do not present towards each other on a slightly arched plane, but incline more or less to the perpendicular, yet this circumstance is not an obstacle to the adjustment of flaps dissected from the tilted palates.

In the event that a fissure is very broad, the opportunity to obtain flaps is so much restricted that a lateral incision may have to be made in order to take the strain from the flaps when they are united with sutures. Should it be necessary to make lateral incisions, the chance of impairing the nutrition of the flaps ought to be well considered. If there be a good belt of undivided tissue in front and behind the incisions there is not much danger of cutting off nutritious supplies.

As in the closure of recto- and vesico-vaginal fistulas, so in staphylorrhaphy, a small aperture will occasionally be left in the seam. This may close of itself in the course of time, or under the scarification of a hot wire. If the opening persistently remain, it may be occluded with a segment of artificial palate: or its border may be freshened, and closed with sutures. However, the chance of closing a pin-hole aperture by a single trial, is not so good as if the fissure were an inch in length.

In cases of fissure extending from the lip to the uvula, with a wide gap between the bones, it is generally best to close the cleft in the lip first, then the soft palate, and finally the hard palate, a number of weeks being allowed to intervene between the operations. As soon as the labial fissure is closed, the pressure exerted by the restored lip tends to narrow the chasm in the hard palate, especially in front.

Fissures in the hard palate caused by necrosis, may be closed by an operation which does not differ from that recommended for the obliteration of congenital cleft, yet as the course of these accidental chasms depends upon a syphilitic condition, it is not good policy to operate too soon, or until the disease has ceased to be active in that part of the body. It is better that the patient wear an artificial palate for a few months; and if the substitute be easily worn and well endured, no operation need be performed.

Orifices in the soft palate are commonly produced by ulcerative action, and mostly close of themselves. Should one prove persistent it would be proper to pare its edges, and close the aperture with sutures. All tension should be removed by making lateral incisions which may extend nearly through the palate.

In regard to the length of time sutures should be allowed to remain in the wound, Mr. Pollock says: "Usually, in the soft palate, the two lower ones should be removed on the second day; and if there be four sutures, one of the two latter should be taken away each succeeding day, that which is highest to be last removed. It has been supposed desirable to retain the sutures in the flaps for a longer period; but in each fresh case that comes under our notice, it becomes more evident, that if union is satisfactorily established, the retention of the sutures beyond the third or fourth day only tends to render it less effective." On the other hand, Dr. J. Mason Warren, in his *Surgical Observations*, and probably speaking by the authority of his father who was a pioneer in staphylorrhaphy, says: "At first I was disposed to remove the sutures at the earliest possible period; but latterly, from having once all the adhesions give way during the act of withdrawing the threads, I have allowed them to remain a very long time."

The patient is not to speak until a day or two after the sutures are removed, but his wants he can make known with a slate and pencil. And when articulation is allowed, the patient should enter upon a course of training that may end in perfect enunciation. So far as modulation of the voice is concerned, a new language has to be learned.

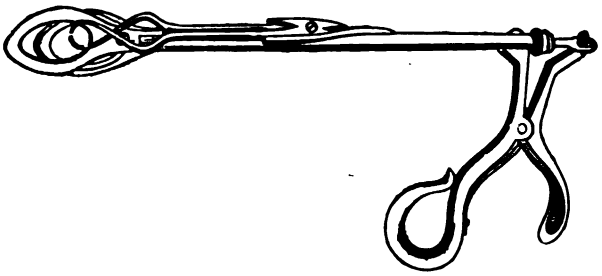
toury, the blade of which has been wound to near the point, with a strip of adhesive plaster. The finger first finds the fluctuating spot, and then the point of the knife is plunged into the tumor. If the first effort be a failure, the finger is to be used to find the evidence of a purulent collection, and then another puncture may be made. There is no danger of wounding a large artery, for the swelling bulges the tonsil into the fauces and away from the internal carotid. As soon as the pus is discharged the urgency of the symptoms is relieved; and in twenty-four hours the patient can breathe and swallow quite comfortably.

An abscess will break of itself if left to take its course for several days, but the disease is so distressing that an early evacuation is extremely desirable. Besides, if the perforation is left to itself the abscess becomes large, so that when it breaks the volume of pus may strangle the patient, especially if the evacuation occur during sleep.

Chronic inflammation and enlargement of the tonsils are common in childhood and adolescence. There is little pain attending such conditions, but the breathing is embarrassed, particularly while the patient is asleep. Persons with enlarged tonsils have a thick voice, and they snore at night. Vexatious coughing is a frequent attendant of hypertrophied tonsils; and bronchial affections seem to hinge upon the faucial trouble. The breath of persons having enlarged tonsils is generally fœtid, the appetite vicarious, the digestion weak, and assimilation bad. A party with large tonsils is subject to recurring attacks of acute tonsillitis, and to ulceration of the fauces, therefore it is well to enforce a course of treatment designed to lessen the chronic enlargement. Some benefit may be derived from the use of iodides, sulphur, iron, arsenic, mineral acids, and vegetable alteratives. A nutritious diet, with judicious out-door exercise, will accomplish much in some cases. Cod liver oil has been in high repute for lessening tonsillar hypertrophy, yet I have not found it so efficient as the agents just named. The topical use of caustics may slowly diminish the size of enlarged tonsils in some instances. I have experimented with tincture of iodine, nitric acid, chloride of zinc, nitrate of silver, and other astringents and escharotics, but rarely accomplished much in the way of reducing the size of the glands.

While it is not necessary to excise a moderately enlarged tonsil, removal with a tonsillotome is the only commendable method when the gland needs an operation. In cases where the voice is muffly, the fauces are too full, a hacking cough is provoked by the size of the tonsils, or there is deafness thereby, excision offers the only hope of radical and substantial relief. It was customary in times past to seize the enlarged tonsil with vulsellum forceps, and then with a blunt-pointed straight bistoury cut off a slice of the gland. Later a guillotine was invented for the purpose. The instrument consists of a ring to surround the gland, a fork to transfix it, and a blade sliding in a groove of the ring-part, to take off a slice of the tonsil. The guillotine is not wholly out of use at the present time, yet it ought to be, for there is a better tonsillotome on the market. It was contrived by Tieman, of New York, and consists of such a combination of pieces of mechanism, that as soon as the ring is pressed upon the enlarged tonsil the operation may be executed in a moment of time and without the patient being able to thwart the effort of the surgeon. The handles are fashioned for the thumb and fingers, as are shears, the shaft has a cutting blade in the shape of an oval ring which moves across the area of the fixed ring by a grasp of the hand; and by the same movement forks catch the piece of tonsil excised. The instrument is reversible so that it can be used upon either tonsil. About the only precaution needed is to press the ring heavily upon the gland before the grip of the thumb and fingers is made which incises the tonsil. If this pressure be not made the action of the throat and the oval shape of the tonsil will push the instrument off without taking a slice of sufficient size to be effectual. When both tonsils need excising, the second operation is immediately to follow the first. The hemorrhage is nev dangerous, and generally insignificant. Soreness of the fauc

FIG. 147.



Tonsillotome.

lasts four or five days, then all disagreeable symptoms pass off. Excision of the tonsils is one of the triumphs of surgery.

Ulceration of the tonsils, or tonsillitis maligna, is often a fearful affection. The inflammation is rapid, the ulceration and sloughing destructive, the prostration great, and the danger imminent. The ushering in of the disease with a heavy chill, the deep seated pains in the entire body, the dusky red color of the mucous membrane of the fauces, and other grave symptoms indicate the evolution of a morbid action similar to that of erysipelas, though the two diseases may not be related. As the malignant tonsillitis progresses, patchy shreds of gray or yellowish membrane appear embedded in the surface of the tonsils, and a little later quite extensive sloughs are separated. The patient is inclined to stupor, and when aroused is too peevish to allow of the throat being examined. The disease is inclined to spread, so that the uvula and soft palate become involved in the havoc of destruction.

It has been noticed that malignant sore-throat prevails in the same atmospheric conditions that erysipelas, gangrene, severe throat forms of scarlet fever, puerperal peritonitis, etc., do; and by some pathologists it is thought that one poison produces all these forms and phases of disease.

The treatment formerly was to use a solution of permanganate of potash locally to the tonsils and fauces, and to administer internally mineral acid and quinia. At present a solution of borax and salicylic acid is employed locally, and champagne is given internally if the patient can swallow any fluid. Ice-cream may be taken for food when deglutition will permit of its passage to the stomach. Externally, to the neck, heat or cold may be applied; the extreme of temperature employed is to be governed by the choice of the patient. One person may select ice, and another a hot poultice; and if the feelings of the sufferer be not consulted some harm may be done.

ELONGATION OF THE UVULA.

When an individual complains of a tickling sensation in the throat, and coughs almost incessantly, it is prudent to examine the fauces, and observe the length and appearance of the uvula. In some instances the soft palate seems to be relaxed or dropped down, so that the uvula is left to titillate the root of the tongue and the throat.

Inasmuch as coughing leads to soreness of the respiratory track, and to the development of thoracic troubles, it is often quite important that seemingly so insignificant a matter as an elongated uvula, should be observed and treated. A uvula which is ordinarily of proper length, will occasionally take on irritation, and its point becomes attenuated and elongated; and after a season of annoyance, the normal state will be resumed.

It has been recommended to use an astringent gargle for the retraction of a relaxed and elongated uvula; and in some instances such treatment may prove quite satisfactory. But the radical method is to excise a piece of the lower end. The operation is performed with a pair of long-handled forceps and long scissors. The common polypous forceps do well. The tip of the uvula is to be grasped with the forceps, and the scissors are made to cut away all that seems to be superfluous. Care must be exercised not to cut away too much of the organ, or a good voice may be ruined. No hemorrhage beyond a few drops of blood follows the excision, and the soreness lasts only a few days.

SURGERY OF THE PHARYNX.

The posterior surface of the pharynx, as well as the sides of the organ are subject to injuries, and to ulcerative action: and foreign bodies are liable to lodge in its cavity. The mucous lining is exceedingly liable to be scalded and irritated by attempts to swallow hot or erosive liquids.

Boys at play will occasionally sustain pharyngeal lesions. A lad was imitating a juggler who in a recent exhibition had run a long knife down his throat: and while his head was thrown back and a wooden sword was being lowered through his mouth, a playmate struck the implement on the handle and drove the point through the walls of the pharynx. The hemorrhage was appalling at first, but soon subsided under the influence of cold drinks and astringent gargles.

Fish-bones are very liable to lodge in the lower part of the pharynx, and produce disagreeable choking and pricking sensations. It is not often possible to see these foreign substances, but they can be felt with the finger forced deep into the throat. It is often claimed that fragments of bone and other foreign bodies have been removed from the œsophagus, when, in fact, they were taken from the pharynx. I have used forceps, scoops, and snares, to remove extraneous substances from the pharynx, but never found any instrument as serviceable as the forefinger for finding and removing fish-bones, and other slender bodies that have lodged in the pharynx. I generally force the finger deep into the throat by pressing back the commissure of the mouth on one side. The finger is to make a sweep of the throat, feeling as it goes; and generally it touches the foreign substance at once, even if a removal of it be impracticable until the patient rests, and other efforts are made. Sometimes it may be necessary to use a pair of long handled forceps, such as are employed for removing polypi from the nose, uterus, and other cavities, to seize and remove pointed bodies that have penetrated the walls of the pharynx, and resist the action of the finger. I once dislodged the piece of a broken needle that got fast in the pharynx, and refused to yield to manipulation. After several unsuccessful attempts to grasp it with forceps, the blades caught the body and removed it.

Ulcers of the posterior aspect of the pharynx are common. They may be syphilitic, or depend upon a scrofulous cachexia. As mucus quite frequently adheres to the throat, it must not be mistaken for an ulcer with purulency adhering to it. Chains of enlarged lymphatics, though not larger than hemp-seed, can readily be discovered in the back wall of the pharynx; and their existence in an enlarged and inflamed state pretty clearly indicates that a constitutional disturbance of a grave character is present. These can not be diminished in size without the internal use of the iodides, iron, mineral acids, and other alteratives. A real ulcer of the pharynx should be cauterized with nitric acid; the escharotic can be applied by using a pencil of soft wood. The stick is whittled round and smooth at the end, then it is to be dipped in the acid, and after all wetness has disappeared in the wood the entire area of the ulcer is to be touched. In two or three days the operation is to be repeated. When the ulcerative process is checked and the reparative action is established, the daily application of pinus canadensis in a fluid form, does excellent service. In ordinary pharyngitis the same agent is valuable when used as a gargle or with a swab or probang.

When the pharynx is scalded with hot liquids, or accidentally corroded with strong acid or alkaline agents, the application of camphor-ice affords about as much relief as any other remedy. A person who gets a burning hot or corrosive agent into the mouth by mistake, rarely lets it drop into the pharynx, or if it do get there, it is rapidly ejected; consequently a deep and damaging burn or erosion is seldom experienced.

FOLLICULAR PHARYNGITIS, as a beaded, granulated condition of the throat on its posterior and lateral aspects, is called, is a grave condition of the pharynx; and quite often indicates an incipient stage of phthisis, which has to be overcome with systemic, as well as local medication: and the treatment does not differ from that already laid down for acute and chronic pharyngitis.

DISEASES OF THE GULLET.

STRICTURE OR CONTRACTION OF THE ŒSOPHAGUS.

The œsophagus is a tube that is liable to contraction from the effects of cicatricial tissue. A foreign body may lodge in the œsophagus, and remain there long enough to establish ulceration, which may be followed by contraction. A young woman was so unfortunate as to have a dental plate containing two artificial teeth lodge in the œsophagus; three days afterwards I was enabled to remove it with a blunt hook. In the course of a few months the patient experienced a difficulty in swallowing ordinary food, and was obliged to live upon nutriment in a liquid form. She rapidly wasted in flesh, and in about a year died of phthisis. The stricture at last contracted so that a number 8 bougie could not be carried past the constriction.

A farmer swallowed a table spoonful or so of liquor ammoniæ, thinking it was rum, until a strangling sensation produced a reversed action in the throat. Some of the caustic passed into the œsophagus, and provoked a violent burning sensation behind the larynx. The œsophageal tube soon began to contract, and at length reached a degree of constriction that compelled a diet of cream, jellies, soups, and gruels, free from lumps the size of a kernel of wheat. I supplied him with a set of bougies, the largest a number 12, and instructed him how to use them. With these he slightly enlarged the passage, and was enabled to keep it from contracting to the narrow calibre attained when the difficulty was in its worst form.

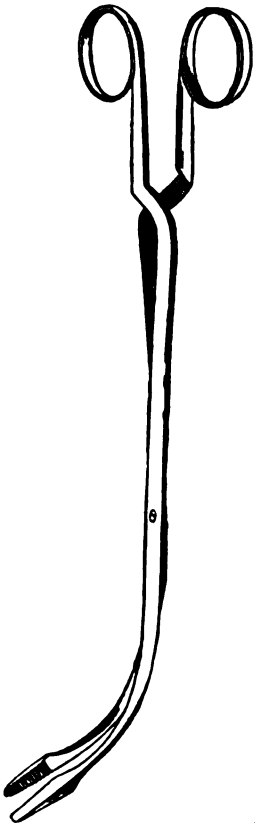
It is not uncommon for patients who have contractions of the œsophagus, to vomit large quantities of a jelly-like fluid. If the retching be severe, the food comes up with the gelatinous substance, and thus the starving victim is robbed of the little nourishment that has been swallowed with so much trouble.

A patient with induration and contraction of the œsophagus from the development of cancerous deposits and growths, is in the most pitiable plight. Nothing substantial can be done for his relief, and he is tortured with the pangs of hunger. If a bougie be used, the end of the instrument may find its way into the trachea, or the cavity of the chest. Hunger may be somewhat appeased by the use of enemata of strong beef-tea, and life may be prolonged by such a course. The patient, at the same time, can take into the mouth and throat the juices of meats and fruits, to satisfy the sense of taste. The desire for food may be abated by the hypodermic use of morphia.

FOREIGN BODIES IN THE ŒSOPHAGUS.

Pieces of meat, bone, bread, buttons, nuts, fruit-stones, and various other substances, may lodge in the gullet, and produce the most distressing symptoms of pricking, choking, and retching. A large body may press upon the trachea and thus endanger life; and a slender body, as a pin, broken needle, or fish-bone, may perforate the walls of the œsophagus, and do harm to neighboring blood-vessels and nerves. Occasionally a needle which has primarily lodged in the œsophagus may harmlessly perforate that tube and travel long distances in the body before making its appearance in the skin at a remote situation. In the course of its vagrancy it may get into the bladder, and become the centre of a calculous formation; or re-enter the alimentary track, and lodge in the folds of the rectum, or become the source of *fistula in ano*.

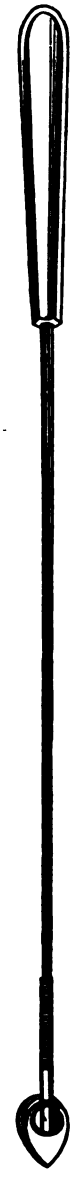
FIG. 148.



Œsophageal Forceps.

The diagnosis of a foreign body alleged to be in the œsophagus is not always easy. Hysterical females who may entertain a strange fancy to create a sensation, may claim to have swallowed a button; and that it has lodged in the gullet. They are able to affect stridulous breathing, and to choke and retch with dramatic effect, though no foreign substance be in the pharynx, larynx, or œsophagus. It is well, then, to be on guard against imposition when treating females who might, under hysterical mania, practice a fraud.

Fig. 149.



Fishgill-extractor.

The œsophagus can be explored at its upper extremity with the finger; and lower down with bougies, whale-bone sounds, œsophageal tubes, and other slender instruments. However, a body the size of a fish-bone, pin, or needle, might not convey an unmistakable impression to the hand manipulating the exploring instrument. I have often been deceived in regard to impressions made upon sounds and bougies. The muscular action of the throat imparts misleading sensations.

When it is determined what kind of a body has lodged in the gullet, and the place where it is located, the ingenuity of the surgeon is to devise a method of removal. The swallowing of a piece of bread may engage a small body and carry it into the stomach. An emetic has been known to dislodge a foreign substance and bring it into the mouth. A button, coin, or similar obstruction may be pushed downwards to the stomach with safety, a whale-bone probang, with a bulb on its end, being employed to clear the œsophagus. The ordinary œsophageal tube can be used for the same purpose. Such instruments can readily be used through the mouth and pharynx when the patient's head is thrown back. There is no danger of entering the larynx, for the instrument is lowered by the tongue as in swallowing, and the natural closure of the epiglottis protects the air passage. No precaution need be taken by the operator not to enter the glottis; but the instrument is to be carried quickly through the pharynx and into the œsophagus. If the instrument pass to the side of the foreign body, it may change its position when withdrawn; or it may provoke a fit of coughing or retching that will effect dislodgement.

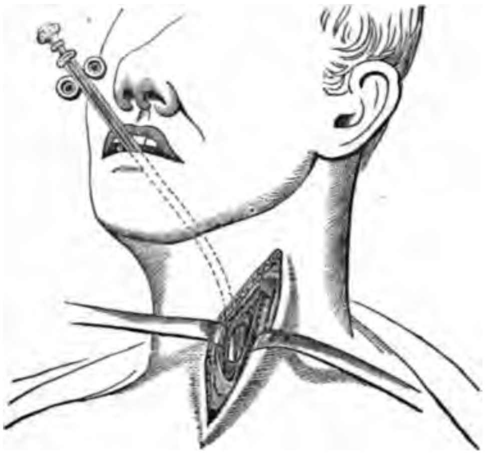
Œsophageal forceps are long and so curved in the beak that they can be readily introduced into the gullet; and the edges of the blades are beveled off so they shall not nip the soft parts, yet the middle portions which come in contact are roughened, and well adapted for securely holding foreign bodies of a spiculated form. I have made some fortunate grasps with these forceps, though as a rule they are apt to miss the object sought.

An instrument with a wedge-shaped point and sides projecting like a fish's gills, is sometimes an excellent piece of mechanism to pass a foreign body, and catch it while being withdrawn. The triangular head is pivoted upon the end of a long piece of whalebone; and its flaring edges are too smooth to roughly scrape the œsophageal walls.

Small, pointed, and slender bodies may be ensnared in a skein of thread attached to the end of a probang or flexible sound. An imitation of this simple contrivance has been constructed in such a manner that it passes into the gullet in a compact form, and then spreads into a multiplicity of loops as it is withdrawn. With some one of the instruments named, almost any foreign body can be removed or pushed into the stomach.

Should a foreign body in the gullet evade all attempts at removal by ordinary means, and the life of the patient be in imminent peril from the presence of the obstruction, the only hope is in œsophagotomy. This formidable operation may be executed by cutting upon the foreign body when its location is known. Commonly it lodges behind the cricoid cartilage, where it may be felt by pressing the finger deep into the side of the neck. A probang introduced through the mouth and pharynx will reach the obstruction and help to determine its location. The left side of the neck, about half way between the sterno-mastoid muscle and the lower part of the larynx, is the best place to make the primary incision. The patient should rest upon the back with the head slightly elevated. The incision in the skin should extend from the upper border of the thyroid cartilage to the upper extremity of the trachea, and at once deepened so as to include the platysma and its fascial envelopes. The finger now easily finds its way between the sheath of the carotid vessels and the larynx, deepening and widening the wound without endangering an important structure. If the foreign body be of considerable size, the finger can feel it through the walls of the œsophagus. Spatulæ or retractors are now employed to hold the wound open while the finger removes cellular tissue and such structures as still cover the gullet. If the foreign body can not be felt, a male catheter is to be carried through the mouth and pharynx, and made to press the walls of the œsophagus into the wound. If nothing important be in the way, the bulging gullet is to be incised for a half inch in longitudinal extent by cutting upon the end of the catheter. The finger may now be introduced into the œsophagus through the wound, when the foreign body can be felt, and its removal considered. If the wound needs extending downwards, scissors may be used to slit the walls of the gullet, and the finger readily cleaves the adjoining tissues.

FIG. 150.



Œsophagotomy.

If a knife be used to extend the wound downwards, the superior laryngeal nerve and vessels, the hypo-glossal nerve and lingual vessels, and the superior thyroid vessels are in danger of being wounded. The opening in the œsophagus having been made an inch in length, forceps can be employed to seize and remove the foreign body.

The wound is not to be closed with sutures, but a compress may be laid upon it, and be held in place with adhesive strips

Food can be swallowed without the use of tubes to conduct it into the stomach. Pressure should be made upon the compress while food and drink are being swallowed; and the compress is to be removed and the wound cleared of substances that may have escaped through the œsophageal opening during deglutition. The wound will heal in two weeks, so that the patient can take food and drink without inconvenience. The dangers of the operation are not great, if the directions just given be followed. The hemorrhage is never considerable unless the operator be unlucky or careless enough to divide an important vessel. But as the dissection in the neck is mostly made with the finger no large vessels need be endangered. When the walls of the œsophagus are incised the flow of blood is quite free for a minute or two, but the pressure of the finger inserted in the opening soon arrests the bleeding. If any of the filaments of the laryngeal nerve be torn or cut, the voice will be modified. As just intimated, feeding tubes are not to be employed, but the patient is to swallow water and liquid nutriment in the usual way. Very little will escape through the wound after two or three days have passed.

DISEASES OF THE LARYNX AND TRACHEA.

LARYNGITIS.

The larynx may be injured by swallowing corrosive acids, caustic alkalies, and hot water; also by the inhalation of steam and flame. But the larynx alone would not be thus injured without the mouth, fauces, pharynx, and perhaps the œsophagus and stomach being implicated, therefore a lesion of the kind could not be discussed as purely laryngeal.

When the scalding, burning, or corroding effect is deep and extensive, the distress is terrible and the danger imminent. Few victims to the lesions named ever survive but a few hours. In milder forms of such injuries the sufferers may live weeks and months, and occasionally recover.

If the larynx and respiratory passages be scalded or corroded, the difficulty of breathing is an alarming feature of the lesion; and tracheotomy is not followed by relief, though the operation might prolong life. The swallowing of small pieces of ice affords some relief to the burning sensations in the throat, but the respiratory distress continues; and as soon as swelling of the epiglottidean folds takes place—and that is an early complication—the patient's life is in extreme jeopardy.

The subcutaneous injection of morphia may allay agonizing pain, yet the struggle for breath remains unabated. The application of ice to the neck may restrain inflammatory action, but the patient in his frenzy will strip off every thing which seems to burden the neck and chest. Laryngotomy affords too little relief to warrant its execution.

In ordinary cases of œdema of the glottis, let the cause be what it may, the danger from suffocation is very great. There is a sensation as if mucus or a foreign substance were clogging up the aperture of the larynx. The voice is hoarse and croupal, and the dyspnœa is alarming. The œdema may be detected by digital examination of the pharynx. The finger discovers two smooth, rounded tumors just behind the swollen epiglottis. The swelling is produced by the effusion of serum into the loose cellular tissue of the upper part of the larynx, but rarely extends below the true vocal cords. Relief may be obtained by scarifying or puncturing the distended mucous membrane. The punctures allow the effused fluid to escape. Laryngotomy may give the patient an opportunity to live over a critical period in the disease.

Erysipelatous inflammation of the larynx is an extremely dangerous affection, and may occur by direct extension of the disease from the face to the fauces. In rare instances erysipelas attacks the throat without an external manifestation. Occurring in whatever way, erysipelas of the fauces and larynx is a most unwelcome form of disease. The patient commonly sinks into a typhoid state, and dies from suffocation or exhaustion.

Syphilitic ulceration of the larynx is fortunately rare, yet I have known the ulcerative action to descend from the fauces to the glottis, and produce such havoc as to result in permanent aphonia. The disease may excite œdema of the glottis, and result fatally. Syphilitic ulceration has been known to lay bare the cornua of the os hyoides and thyroid cartilages which project into the pharynx. The treatment which proves most effective in such cases consists in the frequent application of a solution of borax and salicylic acid. The remedy can be applied with a probang. A favorable systemic impression may be made w iron, mineral acid, the iodides, and vegetable tonics.

Tumors of the larynx are often written about since the invention of the laryngoscope, but were seldom spoken of before Morbid growths of the larynx were once thought to be polypoid, but it is now known that they may be as varied in their character as tumors of the mouth. Hydatid formations in the ventricles of the larynx have modified the voice, and produced a wheezing respiration. Warty and fungous growths of the mucous membrane of the epiglottis and larynx, are among the most common of laryngeal tumors or excrescences. Sometimes the tumor can be seen while the tongue is drawn forward with a spatula, and it can generally be felt with the finger, for if the pedicle be attached to one of the vocal cords, the pendulous mass will often get above the rima and epiglottis.

When a pendulous morbid growth of the epiglottis or larynx can be felt or seen, its removal may be contemplated. Possibly it may be seized with forceps, and excised with scissors. The application of a solution of chloride of zinc with a probang. will check the growth of laryngeal excrescences, and sometimes remove them altogether. Should a tumor develop in the larynx and threaten life from dyspnœa, there would be little hope for prolonged existence except in tracheotomy, and the use of a tracheal tube to respire through. Epithelioma of the larynx is sure to prove fatal in the end, yet life may be sustained a year or two by keeping an opening in the trachea.

Hysterical affections of the larynx are sometimes quite deceptive. Stridulous breathing peculiar to laryngitis can be assumed, as well as paroxysms of dyspnœa. However, if as severe an operation as tracheotomy be undertaken, the patient will suddenly become better. The administration of chloroform will dispel the violence of the symptoms. When aphonia is assumed it is not easy to convert the whispers into audible speech. The free use of assafœtida will accomplish more than any other remedy. While under an anæsthetic it is rare that a hysterical patient can dissemble consistently.

Dyspnœa may arise from a variety of causes, therefore it is not wise to resort to laryngotomy until something rational is ascertained in regard to the origin of the difficulty. A tumor or abscess of the brain might press upon the eighth pair of nerves, or a morbid deposit in the neck could paralyze the recurrent laryngeal nerves. Pneumonia is sometimes attended with laryngeal troubles that are quite apt to mislead the unwary.

FOREIGN BODIES IN THE LARYNX AND TRACHEA.

The sucking of a crumb of bread, piece of meat, or any other irritating substance into the larynx or trachea, is suddenly followed by violent coughing, protrusion of the eyes, blackness of face, and a terribly distressed appearance in general. The patient starts up and gazes wistfully about as if relief must be had, yet the countenance reflects despair. The victim of this sudden dyspnœa clutches at the throat as a sign that it is the source of trouble, if not to signify that the respiratory track must be cleared. A foreign body is not liable to get into the larynx except an act of deglutition is interrupted by a sudden and unexpected movement of the respiratory organs, as in coughing, sneezing, laughing, or talking. In other words, the epiglottis, which closes when food or drink is being swallowed, is forced open by a sudden expulsion of air from the lungs, and a spasmodic inspiration quickly succeeding, may draw into the larynx a substance that was in the lower part of the pharynx and ready to be swallowed. When a hard substance escapes accidentally from the mouth to the pharynx, it may meet with resistance, or provoke choking, and at the same time be sucked into the larynx, which has been forced open by the spasmodic and reversed action that has been excited in the stomach and lungs.

A small and light body in the larynx may be readily expelled during a fit of violent coughing which the presence of the substance produces; but a large body, especially if it be heavy, becomes lodged in the air-passages, or moves about in the trachea and bronchial tubes. A child three years of age was supposed to have sucked a water-melon seed into the trachea, and the mother brought the child to me to have it cut out. A violent cough attacked the patient every few minutes which seemed quite distressing, but as there was apparently no immediate danger, I refused to perform tracheotomy. Paroxysmal fits of coughing were endured every day, from September to December, when the seed was thrown out forcibly. It had not changed in appearance during that time, and the child had not lost flesh. I examined the patient several times during the three months the seed was in the air-passages, and became satisfied, from the cough and whistling sound the foreign body produced, that it chan its position from time to time. In one instance I could locat in the right bronchus; on another occasion I was convinced th the larynx was the part invaded; and I am satisfied that once I heard it moving up and down in the trachea.

A lad six years old was brought to me from Kentucky, with the assertion that he had drawn a plum-stone into his larynx, and that a paroxysm of coughing and choking came on two or three times a day. The foreign body had been in the air-passages over four months, and was reducing the patient's health and strength. The whistling sound indicated that the body was in the lower end of the larynx. I kneaded the parts with my fingers, then raised the lower part of the patient's body, so that his head should hang down. I then slapped the back part of the chest a few times, and the plum-stone flew out of the lad's mouth. The boy afterwards said that when I squeezed his throat he could not speak nor breathe. I conjectured that the manipulation changed the position of the fruit-stone, and thus favored its expulsion.

In October, 1858, I opened the trachea of a little girl ten years old, at Hart's Mills, Ind. The patient had drawn a button into the larynx the day before, and was nearly dead from dyspnœa and fright. She had remained very quiet for the last twelve hours to avoid a paroxysm of coughing. After I cut through the trachea the breathing was easier, but the foreign body could not be found. I passed a catheter through the fauces and into the larynx, where the button was felt, and pushed downwards into the trachea. In a minute afterwards it appeared in the wound, and was removed quickly with forceps. The patient made a good recovery.

When a foreign body passes the larynx and gets into the trachea, it is quite liable to lodge in the right bronchus, where it creates considerable disturbance in the lung below. Foreign bodies in the respiratory passages are apt to excite inflammation of the lung-tissues, and to produce many of the symptoms of pneumonia. When it is not suspected that a bead or cherry-stone has entered the larynx of a child, the symptoms are declared to be those of croup; and later the lungs become so much implicated that inflammation of them is suspected.

April 3d, 1843, Mr. Brunel, the famous Thames tunnel engineer, was playing with a half-sovereign in his mouth, when it slipped behind his tongue, and a violent fit of suffocative cough ensued. In the course of the evening he coughed moderately at intervals, yet entertained some friends at dinner. Three or four days after the cough became aggravated, and a pain located itself in the lower portion of the right bronchus. On the sixth day Mr. B. took two aperient pills, one of which was ejected by vomiting, and during the act he felt the coin shift its place, which relieved the pain in the chest. On the 15th day the patient placed himself in a prone position, with his sternum resting on a chair, and his head and neck inclined downwards; and soon experienced the sensation as though the coin left the bronchus and moved into the trachea. Several surgeons now examined the chest and neck with a stethoscope, but the presence of the foreign body could not be detected by any abnormal sounds. On the 24th day it was decided to make an opening in the trachea between the thyroid gland and the sternum. In proposing this, a twofold object was in view; the one, that if the coin were lodged in any part from which it might be safely extracted with forceps, the plan might succeed; and the other, that, if relief could not be obtained in this manner, the artificial opening might answer the purpose of a safety-valve while attempts were made to expel the coin by pounding the back of the thorax while the head was lowered. Sir Benj. C. Brodie performed the operation, but could not reach the coin with forceps introduced through the wound. In fact, the forceps excited such convulsive coughing that it was not thought proper to explore the inside of the trachea with them.

Ten days after tracheotomy was performed, the patient was placed on an inclined plane with the head lowest, and the back was struck with the hand: two or three efforts to cough followed, and presently the patient felt the coin quit the bronchus, striking almost immediately against the incisor teeth of the upper jaw, and then dropping out of the mouth; a small quantity of blood, drawn into the trachea from the granulations of the external wound, being ejected at the same time. In two or three weeks the wound in the neck healed, and no difficulty of any kind remained. There is no probability that the tracheotomy in this case did any good. The coin was ejected by lowering the head, and slapping the posterior aspect of the thorax. If the foreign body had been extracted or expelled through the wound, the result would have passed as a noted triumph in surgery.

In 1854, Dr. E. H. Davis, of New York, performed tracheotomy ten days after a piece of nail had been drawn into the trachea through the mouth and larynx. Explorations through the opening failed to discover the foreign body. On the ninth day after the operation the nail was ejected through the larynx and the mouth while the patient was lying on his abdomen with his head and chest well lowered, and a heavy blow was struck between the shoulders.

Dec. 10th, 1837, a child three years old, the son of Esquire Belden, of St. Johnsburg, Vt., sucked an eight-penny nail into the trachea, and it subsequently lodged in the right bronchus. The coughing from day to day was violent, and on the 11th day it was decided to perform tracheotomy. Dr. Calvin Jewett made an opening into the trachea, and through it he was enabled to touch the nail with a probe, but he could not grasp it with forceps. About one month afterwards the boy coughed up the nail while in bed. Subsequently he made a good recovery. It may be remarked that the head and chest were not lowered while a blow was given between the shoulders. The tracheotomy did no good, except to determine the position of the foreign body.

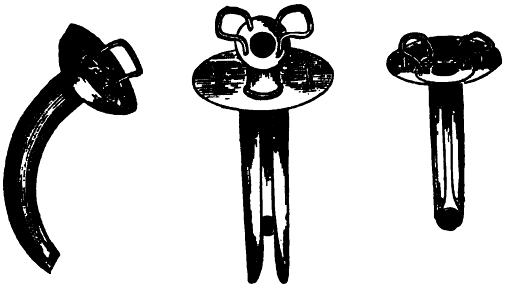
In Chelius' Surgery is reported a case of laryngotomy performed by Mr. Dicken, of Middleton, England, to extract a bell-shaped button which had lodged in the right bronchus. Forceps introduced through the wound excited no coughing, and were made to grasp and remove the button.

Dr. Paul F. Eve, of Nashville, Tenn., performed tracheotomy on a child five years old, and removed a shingle nail that had lodged in the left bronchus, and remained there three weeks. The child made a good recovery.

LARYNGOTOMY.

About an inch below the pomum Adami is a soft, depressed spot in the larynx, which is called the crico-thyroid space. It is crossed transversely by a small artery that may be divided without danger of troublesome hemorrhage. To make an opening from without into the larynx at this point is termed laryngotomy. The operation is performed to let air into the respiratory passages when the rima glottidis is obstructed by a foreign body or disease. It is executed as follows: The head of the patient being thrown back and steadied by an assistant, the finger finds the crico-thyroid depression. The larynx is then fixed with the left hand, while the right, guiding the knife, makes a vertical incision nearly an inch in length in the skin covering the depression, the median line being followed. As soon as the bleeding has ceased, the crico-thyroid membrane is divided to a sufficient extent to allow the introduction of an instrument or a respiratory tube. If the opening in the membrane is not large enough for the purposes named, the incision may be extended so as to divide the cricoid cartilage. The tube may be borne without irritation, but if it excites violent coughing and a sense of choking, the instrument may be removed, and an aperture sufficiently large to breathe through may be cut in the membrane and the cricoid cartilage. The larger the larynx the more suitable it is to undergo laryngotomy. Although quite a simple operation, it should be performed with care. It would be unpardonably careless to cleave the mucous lining of the larynx from the cartilages. Usually there is no occasion for immoderate haste in the performance of the operation. The wound closes by granulation.

FIG. 151.

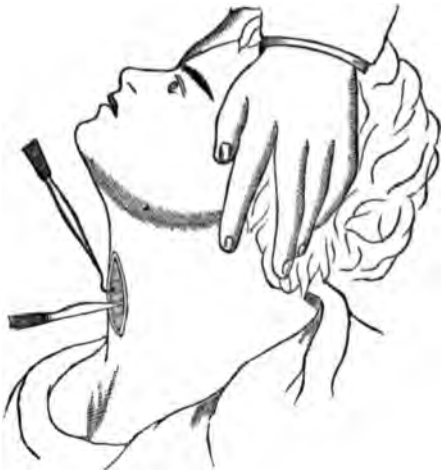


Straight and curved laryngotomy and tracheotomy tubes.

TRACHEOTOMY.

When it is necessary to open the trachea to prevent suffocation from croup, to facilitate the expulsion and extraction of foreign bodies, and to save life threatened with asphyxia, the aperture is usually made below the isthmus of the thyroid gland. The shoulders of the patient should be well raised, and the head moderately extended or thrown back, in order to project the windpipe forward and render the skin tense. An assistant supports the head, and holds the patient's hands and arms out of the way. A child should have its arms confined by means of a towel pinned round the body. Everything being in readiness, an incision nearly two inches in length is made through the skin in the median line of the neck, from a little below the cricoid cartilage to the top of the sternum. The anterior jugular veins are to be avoided by keeping exactly in the median line. The fascia is to be divided on a director, and the contiguous borders of the sterno-hyoid muscles separated with a scalpel handle. Below is some loose areolar tissue containing the inferior thyroid veins. This must be raised on a director, and the vessels divided with scissors, if they can not be pushed to one side. If a divided vein bleeds, it may be compressed with forceps, or even ligated, to get rid of all hemorrhage. When the wound is dry and the trachea exposed, two or three rings of the windpipe may be incised by cutting from below upward while the tube is made tense by pulling the larynx towards the chin. As soon as the trachea is opened, the cold air rushes in, and excites a fit of coughing. The effort sometimes starts afresh a little venous hemorrhage, which, finding its way into the windpipe, is provocative of a cough, and when plentiful may strangle the patient. After the bleeding has ceased a respiratory tube may be introduced into the slit made by the trachea. If this provokes paroxysms of coughing, it may be romoved, and the slit enlarged into an oval opening. Exploring instruments may be used through the slit, and also forceps when foreign bodies are to be removed. The temperature of the room should be kept high, as the air goes directly to the lungs without being warmed by passing through the mouth and larynx.

FIG. 152.



Tracheotomy.

While the operation is being performed it may be necessary to push the isthmus of the thyroid gland upward to avoid the hemorrhage that might arise from cutting that vascular structure. However, if it be necessary to divide the isthmus in order to gain space along the trachea, there is no great risk in making the division. The hemorrhage will not be so profuse but it can be controlled in a few minutes.

Before the trachea of restless patients is opened it is well to fix the windpipe with a tenaculum; and as soon as the trachea is opened the chin of the patient should be depressed and the wound held open with spatulæ or tenacula. A band of lead just long enough to go round the neck posteriorly, and to have its bent ends act as spatulæ, makes a good substitute for a tracheal tube or curved canula. An ordinary respiratory tube used in tracheotomy is double; the outer one remains in the wound, and the other is removed from time to time, to clear it of mucus. As soon as the trachea is opened, the air ceases to pass through the glottis, consequently the voice is lost until the artificial aperture is closed.

Tracheotomy has been performed to relieve the dyspnœa of epilepsy, tetanus, hydrophobia, œdema of the glottis; and it is occasionally justifiable in croup, though a little patient gasping and struggling in the throes of death, is rarely relieved or saved by the operation.

A patient with a foreign body in the larynx or trachea is liable to die at any moment, and in the event that death occurs directly after the medical attendant has refused to perform tracheotomy, the charge may be made that the physician was guilty of neglect; but the accusation is not always just, for the statistics of tracheotomy show that the operation frequently affords no relief, and often is the apparent cause of death. Tracheotomy is a legitimate operation, but it is not always to be performed when foreign bodies have entered the air passages, or, at least, until it is plain that the patient can not long survive without relief.

SECTION XV.

DISEASES OF THE THORAX.

Wounds of the lungs are common, and mostly produced in personal affrays by shooting and stabbing. While they are all serious and even dangerous to life, recovery is not infrequent when the heart and large vessels escape injury. Hemorrhage is one of the impending dangers attendant upon wounds of the lungs, therefore if the bleeding has been arrested by the formation of a clot, the probe should not be employed to explore the wound.

Hernia of a portion of the lung after a large opening has been made in the chest, is a complication worthy of consideration, though such an occurrence is rare. "The size of the hernia," says Mr. Poland, "varies from that of a small marble to that of a cricket-ball, and it forms a more or less globular mass, consisting of the lung-tissue, covered by its own pleura, and having no investing sac; its base is constricted, and encircled by a kind of neck, formed of the external wounded integument and the tissues in the intercostal space. The protruded lung may be at first simply congested; but this congestion may increase to such an extent that the lung may assume a very deep black color, without, however, any loss of vitality; but when the constriction continues, and the congestion and exudation increase, together with long exposure, gangrene will ensue, and sloughing off of the whole mass takes place, constituting a natural cure. The prognosis of these cases is generally favorable. The treatment will depend chiefly on the state of the lung, and the length of time which has elapsed since its prolapse:—if the prolapse be recent, and the lung healthy in appearance, it may be reduced by careful and moderate manipulation, care being taken not to injure its delicate structure in so doing; should, however, this be impracticable, owing to the very great constriction of the neck, the latter, provided it be formed entirely of soft structures, may be cautiously divided, care being taken to avoid wounding the lung or the intercostal vessels. If the lung be in a gangrenous condition, it may be left to nature to throw it off by sloughing; or it may be surrounded by a ligature, and tied; or it may be excised, in order to expedite matters;—all these measures have been severally and successfully tried."

Hernia of the lung through a ruptured intercostal space, with no opening in the skin, is like the protrusion of any viscus through the walls that enclose it. The existence of such a hernia is determined by the appearance of a tumor under the skin—generally between two ribs,—and the swelling moves simultaneously with respiration, expanding during inspiration and diminishing in expiration. If respiration be suspended the tumor disappears; and enlarges equally at all points while the patient coughs.

The treatment consists in reducing the hernia and applying a pad which is held in place by an elastic belt worn around the thorax. A compress applied to the opening, and held in place with adhesive strips will effect retention.

PARACENTESIS THORACIS.

Empyema, and effusions into the pleural cavities, often require puncture of the thoracic walls to get rid of the fluids. The operative procedure is called *paracentesis thoracis,* and is not difficult to execute when the diagnosis is once clearly established, and warrants the use of the knife, aspirator, or trocar.

The symptoms indicating fluid in the pleural cavity are, difficulty of breathing, coughing, pain in the chest, and especially a fullness on the suspected side, which is marked. As the chest is stripped it will be seen at once that the spaces between the ribs are filled to bulging, and there will be a dropsical infiltration in the subcutaneous areolar tissue. The distended half of the chest is heavy on percussion, and fluid can be heard to gurgle as the body is moved, or during respiratory movements. Generally the murmurs and bruits are all silenced, and no more sounds will be heard upon auscultation than if listening over the liver, unless the slop or tinkle of a fluid be heard. The finger pressed against a rib, or in an intercostal space, will leave a pit or indentation as when a dropsical leg is pressed upon.

The objections raised against paracentesis thoracis are, 1st, the necessary introduction of air into the cavity of the chest; 2d, the impossibility of entirely emptying the chest; 3d, the danger of taking away too great a quantity of fluid; 4th, the impossibility of breaking down old adhesions, or of preventing new ones; 5th, the probable rupture of air-cells and vesicles; 6th, the production of pleurisy and pneumonia; 7th, the more rapid reproduction of the fluid; 8th, the possibility of the persistence of a thoracic fistula.

These objections are raised by the timid, and are mostly too flimsy to require serious consideration. The greatest danger is from the results of a disease that has established a condition which calls for paracentesis thoracis. About one-third of all cases requiring thoracentesis will ultimately die of consumption; yet this is not a valid reason why tapping should not be performed to afford temporary relief and to prolong life. If it were urged as an objection to paracentesis that the diagnostic signs can not be depended upon, I should feel as if there were some grounds for an argument, as the most expert diagnosticians have made mistakes. Mr. Edward Cock has an excellent paper on this subject in *Guy's Hospital Reports.* With respect to exploration previous to performing paracentesis, he says:—

"Notwithstanding the perfection to which auscultatory diagnosis has been brought, and the exactness with which a practised ear is enabled to appreciate the deviations from natural structure and function within the thoracic cavity, the most experienced practitioner will sometimes be mistaken in his opinion, or, at any rate, puzzled by modifications of disease and conflicting evidence, which tend to obscure the clear signs of the presence of fluid. Under such circumstances it is always advisable, previously to tapping the chest, to explore the part in such a manner as shall, at any rate, inflict no injury on the patient, although its result may convince us of the inutility of a further operation. For this purpose a needle ensheathed in the smallest sized canula is the best; the grooved needle invented for making explorations is unsatisfactory. The needle and canula explorer is passed between the ribs into the suspected spot; the needle is withdrawn, and the escape of fluid from the tube at once indicates the existence and nature of the abnormal secretion. A further investigation as to the size and direction of the cavity, may also be obtained by introducing a fine silver probe through the canula.

"In the great majority of instances, the existence of the fluid is most clearly indicated at the lateral and posterior part of the chest, in a position somewhat central between the upper and lower boundaries; and in every case which has come into my hands, I have had occasion to tap below the angle of the scapula, between the seventh and eighth ribs, or the eighth and ninth ribs, and at a point distant from one to three inches from the angles of the costal bones. Our incapability of judging of the exact positions of the diaphragm, and the alterations which are liable to occur about the floor of the chest from recent or old adhesions between the muscle and the base of the lungs, would lead me to deprecate the practice of a low puncture. When we have the choice of two or three intercostal spaces, I would select the upper, or, at any rate, the middle one, as the safest and least obnoxious to those casualties which may induce a failure in our object. Any advantage supposed to result from a depending opening can readily be obtained by adapting the position of the patient to our purpose.

"The best instrument I have found adapted for opening the chest, is a trocar and canula about one-twelfth of an inch in diameter, and about two inches in length, exclusive of the handle. I prefer a circular to an oval instrument, as the former is more easily introduced, and does less injury to the intercostal muscles, whose fibres are perpendicular to the long diameter of the oval canula. The small canula has many advantages: its introduction is easy, and attended with little friction; it gives but very slight pain, and it is calculated to elude the nerves and vessels; on its withdrawal, the opening which it has made becomes immediately and permanently closed, thus at once restoring the integrity of the cavity which has been entered; it is adapted to all ages from the infant to the adult, and can hardly fail to find its way between the ribs, however narrow the intercostal space may be. Again, it insures a slow and gradual evacuation of the fluid, and enables us to avoid the admission of air; at the same time allowing a better opportunity for the lungs to expand, and enable us more effectually to empty the cavity.

"It now only remains for me to describe the operation itself, which, as regards the pain it inflicts, is so trifling that, by avoiding all unnecessary display and preparation, the patient may be led to consider it as little more than the sequel of the discipline to which he is occasionally subjected when it is considered essential to make a thorough examination of the chest; the same position of the body being alike adapted for the one process as the other. It will be found most convenient to let the patient sit *across* the bed, so as to admit of his body being readily lowered and supported over its edge. The spot having been determined upon, it is advisable to make a small puncture in the skin, just at the upper edge of the rib, with a narrow-bladed lancet, through which opening the exploring needle, and subsequently the trocar, may be inserted. This preliminary step is not absolutely necessary; but as the skin is by far the most impenetrable and resisting of the tissues to be traversed, its previous division will render the introduction and withdrawal of the canula more easy, less forcible, and attended with a minor degree of pain and alarm to the patient. The exploring needle having been first introduced, and the presence of the fluid ascertained, the trocar and canula may then be carried into the chest through the same track, giving the instrument a slight obliquity upwards, which will enable it to cleave the edge of the rib. The depth to which the trocar must be passed, will of course depend much on the thickness of the parietes, the presence of fat, muscle, or œdema, for which due allowance should be made; and, in most instances, the penetration of the pleura will be appreciated by the sensation conveyed to the fingers of the operator, especially if the integument has been previously incised, so as to diminish materially the friction.

"The remainder of the operation consists in getting rid of as much fluid as the strength and condition of the patient will bear, and carefully avoiding the admission of air into the cavity. On withdrawing the trochar, the fluid will at first be found to flow in a steady and equable stream, slightly augmented in force at each expiration. After the lapse of a shorter or longer period, the flow will become checked at each inspiration, and then the body of the patient should be gently lowered into a horizontal posture, and turned slightly on to the affected side, so as to bring the cavity directly over the opening; and in this position he should be duly supported by assistants. The fluid will now recommence flowing in an uninterrupted stream; and when it again begins to flag, a still further quantity may be obtained, if the state of the patient permit it, by directing an assistant to make steady and continuous pressure on the lower part of the chest, by grasping it on either side with the hand. This may be kept up for a period varying from a few seconds to a minute, until a continuous stream can no longer be obtained, when the canula should be immediately withdrawn. The greatest care should be taken to remove the tube, and thus close the opening, while the chest of the patient is yet in the grasp of the assistant; for, if he relax the pressure while the communication with the pleural cavity is still open, air will infallibly rush in.

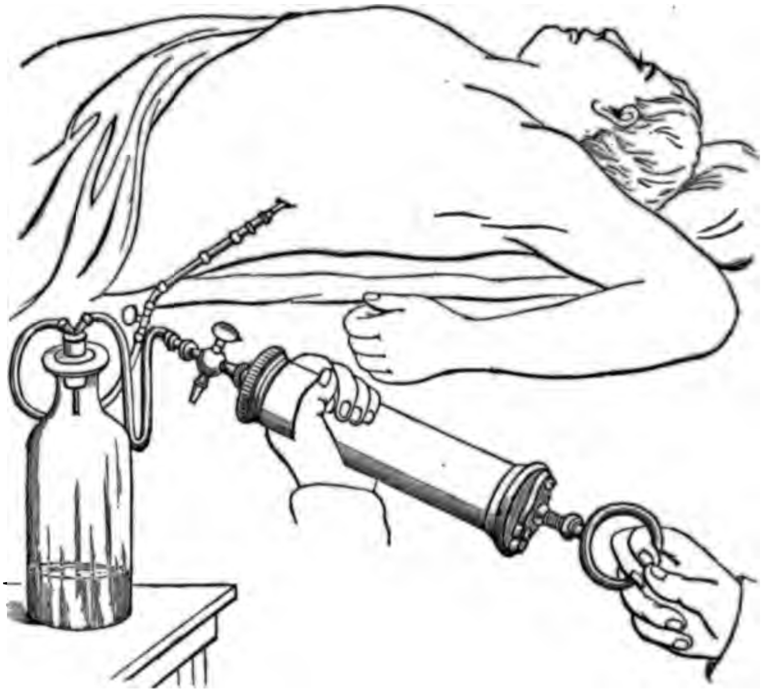
"During the whole process of evacuation the unremitted attention of the operator should be directed to the stream of fluid, which he should never allow to become completely interrupted during the effort of inspiration. The admission of the slightest quantity of air is immediately indicated by a peculiar sucking noise, which can not be mistaken, and which should be the signal for the prompt withdrawal of the canula. The wound requires nothing but the application of a small dossil of lint and a strip of plaster; and the patient may then be laid down in bed."

Chassaignac evacuates the chest with "drainage-tubes," which consist of rubber tubing, perforated near the middle with scissor-cuts. After the ordinary operation of paracentesis, a firm, long iron probe, somewhat bent, and having a strong piece of silk passed through its eye, is introduced into the opening and directed towards the lower and back part of the cavity; the end of the probe is then made to press against the sides of the thoracic walls, so that it may be felt externally between the intercostal spaces, when an incision is to be made upon it, and the probe brought through the opening thus made. Having secured the drainage-tube to one end of the silk, it is to be drawn through and brought out externally, and the two ends of the tube tied together outside.

Still later than the invention of the drainage-tube has been devised what is called the Pneumatic Aspirator for evacuating the pleural cavity. The instrument is so constructed that fluid can be taken from a shut sac and not admit the entrance of air to take its place. It is simply an exhausting air-syringe, with a double tap for ingress and egress of fluid, the taps being so made as to fit into a hollow trocar.

The aspirator of Molesworth, which is a modification of that of Dieulafoy, is the one represented in the accompanying diagram. It can be employed to remove air or liquid from the pleural cavity, or from any other sac or space. It is just the instrument to empty an over-distended pericardium; and may be employed to lessen the size of the protruding portion of a strangulated hernia. There are several hollow needles which go with each instrument, the variety affording different sizes. It is now well established that the parieties of several of the cavities may be punctured with a small aspirating needle without inflicting a dangerous wound. Even the intestines and the bladder may be perforated with a medium sized needle, and no peril from peritonitis or cystitis arise. The needles may be used to explore hydroceles, and other accumulations of fluids in sacs. An ovarian tumor may be explored and aspirated without serious consequences.

FIG. 153.



Molesworth's Aspirator.

But the commonest use for the aspirator is in evacuating the pleural cavity when distended with serum, pus, or other liquid. The needle is sent through the thoracic parieties, when a few drops of fluid show that the cavity is entered; the rubber hose having a stop-cock is then attached to the needle, the thumb-piece being so turned as to prevent the fluid from entering the hose until the bottle is exhausted of air by the aid of the pump and its valves. As soon as a vacuum is produced in the bottle or jar, the cock on the pump-side is closed, and the one on the needle-side is opened. Fluid will now be seen to pass through the section of glass tubing which is inserted in the hose for that purpose; and the liquid is also viewed as it falls into the air-exhausted bottle. If it be desirable to inject fluid into the pleural cavity which has been evacuated, the stop-cock on the needle-side is turned, the cock in the bottle removed, the jar emptied, and then partly filled with a simple or medicated solution. Air is next pumped into the bottle until considerably condensed; turn the bottle upside down, so the liquid shall be next the cock, and the air uppermost; and then open the cock on the needle-side, when the fluid will rush through the hose and needle, and enter the cavity. Reversing the operation will withdraw the liquid. The diagram shows how aspiration is executed.

As a general thing I make a slight incision in the skin with a knife, and then puncture the walls of the chest with a trocar and canula. If much fluid exists in the pleural cavity it necessarily compresses the lung and bulges out the ribs or thoracic walls; therefore as soon as the trocar is withdrawn the canula begins to evacuate the cavity, and as fast as evacuation goes on, the lung resumes its normal shape and the parieties of the chest return, so that there is no room for air to enter. And if a small quantity should enter, it will do no harm. Should one evacuation prove sufficient, as it rarely does, the air which has entered will be disposed of as readily as in an ordinary case of emphysema: and if subsequent evacuations become necessary, the imprisoned air, if any existed, could escape with the fluid. In cases of empyema one evacuation is never enough, consequently it would be a frivolous piece of work to attempt to keep the fluid drawn off, and to prevent the entrance of air. I have frequently made an opening in the chest to evacuate pus, using no precaution against the introduction of air; and after the wounds have discharged for several days, weeks, or months, as the case might be, they have healed voluntarily, the discharge stopped, and the patients recovered. I have had such good fortune with this method that in many instances I regard it as superior to evacuation with an aspirator. Often the fluid has lumps in it which will block the narrow channel of an aspirating needle.

An aperture made in the parieties of the chest to evacuate serum or pus tends to close in a few days; and if it does so before the production of fluid has ceased, another opening in the vicinity of the first will be spontaneously made, unless the original perforation be re-opened artificially. The cessation of the purulent discharge is rarely sudden and permanent, but a small quantity of fluid will gather and seek exit from time to time, until finally the cavity is obliterated by the reparative processes, and no more trouble is experienced.

In April, 1875, I was called to see Warren Langdon, 21 years of age, who had been suffering from pneumonia a week or two. He was troubled with a severe cough and dyspnœa, and was greatly emaciated. Colliquative sweats and rigors indicated great vital depression, and the probable existence of pus in the pleural cavity. Upon stripping the chest it was evident that the left side of the thorax bulged out considerably. The point of greatest protuberance was just below the nipple, consequently I selected this as a place for making a puncture. I incised the skin to the extent of an inch in the course of the ribs, and probably between the sixth and seventh, though I took no pains to count. I used the grooved director to raise the intercostal muscles before dividing them, and then employed the finger to feel for fluctuation. I ascertained that the fluid was mostly above the wound, therefore I directed the point of the bistoury upward while incising the pleura. A large quantity of pus sought exit, but a clot of fibrin soon plugged the opening. I then re-introduced the knife and made a larger aperture. Two quarts of pus were discharged within ten minutes, and as much more before morning. A pint of purulent fluid found exit every day for a month, when the quantity lessened from day to day for another month, until the discharge ceased altogether, though not without two interruptions of a week or so, when a rigor would be experienced, and the subsequent outbreak attended with the escape of an ounce or more of pus. The patient regained perfect health in four or five months after thoracentesis was performed.

This case is related as a representative of a half dozen other cases of a similar termination after ordinary paracentesis performed with a bistoury, no trocar and canula being at hand, and to show that the puncture was in the anterior aspect of the chest close to the pericardium. I think that the lung tissue was implicated in the abscess, yet the purulency may have been confined to the pleural cavity. The usual place to make the opening is between the sixth and seventh, or seventh and eighth ribs, at a point quite far back. However, the point of greatest prominence produced by the internal pressure, is often to be selected for puncture. I do not regard the operation as attended with any special danger. I desire a free evacuation at once, and rarely attempt to check a profuse discharge. It may be well to give the patient a stimulant, though relief to the compressed lung seems to be attended with recuperative vital action.

Hydro-thorax signifies water or serum in the pleural cavities, and may have to be treated like empyema. The effusion is produced by pneumonia or pleuritis, or the two in combination. The diagnosis is made out by the dyspnœa, cough, pain, bulging of the thorax on the affected side, œdema observed in the intercostal spaces, and by the sound of moving fluid in a cavity, which is heard during respiration and the heart's action. The treatment consists in the use of veratrum, nitre, gin, or gelseminum internally, and turpentine externally. If the serum be not absorbed under the influence of such medication, and the accumulation is abundant enough to be attended with great distress, paracentesis may be performed with a prospect of relief. It is well to attempt the evacuation by the use of a pneumatic aspirator, but if this proves incompetent through a blocking up of the needle, as it sometimes will, the trocar and canula may be used. When in the country, and neither instrument was at hand, I have made an aperture in the walls of the thorax with a bistoury, incising the skin first, the intercostal muscles next, and finally puncturing the pleura with care. Air will find its way into the pleural cavity, yet not in quantities to compress the lung. Should the opening become blocked too soon, a probe or the grooved director may be employed to re-establish the communication.

Emphysema, or the infiltration of air into the subcutaneous cellular tissue, when occurring in the vicinity of the chest, is due to wounding of the lung and pleura, and generally the sequence of a fractured rib. Penetrating wounds of the thorax, the lung-tissue or bronchi being reached, are often attended with more or less emphysema. However, if the wound in the skin remain open, and on a line with the deeper lesion, the air escapes, but often the integument slides and covers the passage out, so that air from the lung becomes diffused in the cellular tissues. In the advanced stages of phthisis, the ulcerative process may establish a communication between the lung and the subcutaneous structures on the outside of the thorax; and thus produce emphysema. Cases are reported in which air has, from the cause just indicated, found its way into the posterior mediastinum, and then through the superior extremity of the thorax, and into the cellular tissue of the neck, diffusing itself to a great distance, even through the whole body.

The symptoms of emphysema consist of a puffiness or swelling of the integument at some point on the thoracic walls, and gradually yet progressively extending in all directions, the skin remaining of a perfectly natural color; the tumefaction has a peculiar and distinctive character, which renders its diagnosis easy,—it crepitates or crackles under pressure. When a dry bladder filled with air is manipulated a similar sound is elicited. The finger forces the air into the adjacent areolar tissue, but some of it returns again as soon as the pressure is removed. This is different from œdematous swellings, which pit on pressure, and the indentation remains sometime. When the wound in the lung is large, the whole body may be blown up as if a blow-pipe were inserted beneath the skin and great power were exerted in the distending process.

In ordinary cases, or in those where the air does not extend much beyond the seat of injury, the danger is inconsiderable, but when the skin is enormously blown out, the breathing and circulation become so much impeded that death may result.

The treatment consists in restraining the diffusion of air by a ring-compress; and in puncturing the skin in places when the distension is dangerous. The cupping-glass has been successfully employed to draw the air out through the punctures. A moderate amount of diffused air, if not increased, is soon decomposed and dissipated.

Pneumo-thorax is a compound term used to denote an accumulation of air in the pleural cavities. Of course, there must be a perforation of the lung and the pleura-pulmonalis to permit the air to enter the cavity. This may occur from a stab which is at once followed by closure of the aperture in the pleura-costalis; or from disease of the lung which establishes a communication between the pulmonary tissue and the pleural cavity. When the symptoms are distressing it is supposed that the accumulating air forces the lung towards the spine and center of the thorax. It has also been conjectured that a flap of pleural membrane might act as a valve to the opening in the pleural cavity, allowing air to enter, but preventing its return to the lung.

The symptoms are sometimes distressing, the dyspnœa being as great as in empyema. There is a tympanitic resonance of the chest on percussion, amphoric respiration, and a metallic tinkling on auscultation.

The treatment in ordinary cases amounts to little except to sustain the patient for a few days, when a change for the better usually occurs, the opening in the pleural membrane becoming clogged, and the air decomposed and absorbed. In urgent cases the pneumatic aspirator may be employed to discharge the air.

Hæmo-thorax is an accumulation of blood in the pleural cavities. Penetrating wounds of the chest, with puncture of the lung, are the common cause, the opening in the parieties of the thorax becoming obstructed so that the blood has no chance to escape.

The symptoms are those attending internal hemorrhage, and if much blood is effused, death ensues from loss of the vital fluid and suffocation. If the patient survive the hemorrhage and dyspnœa, the decomposition of the blood has a devitalizing effect. The physical signs of hæmo-thorax are, bulging of the intercostal spaces, as in empyema; dullness on percussion; and absence of the respiratory murmur on auscultation. Ecchymosis at the base of the chest is not uncommon.

The treatment consists in sustaining the patient's vital powers, and making him as comfortable as possible, by placing him in nearly an upright position, with the hope that the hemorrhage will cease, and the effused blood be absorbed; but if a large quantity of blood is suspected to be in the pleural cavity, and the vital depression renders the case too critical to be longer waited upon, paracentesis thoracis is the only means of affording relief. The opening in the thoracic parieties should not be allowed to close until it is evident that the coagula have decomposed, and the debris has escaped.

When a foreign body, as a bullet, or piece of a broken dagger, is suspected to be in the lung or pleural cavity, it is to be let alone until from suppuration an attempt at removal may be attended with success; and then an opening may be made between the ribs at a point most likely to reach the spot where the foreign body has lodged. The aperture made in the thoracic walls must be large enough to admit the finger or forceps. A leaden bullet may become encapsuled in the thorax, and remain for years without provoking serious harm.

Hydrops pericardii signifies an effusion of serum in the space between the heart and the pericardium, as a sequence of pericarditis. The symptoms are a labored condition of the heart, and a metallic tinkling or resonance made known by a stethoscopic examination. A bulging of the ribs in the cardiac region, and a distant sound to the heart, are also signs of pericardial effusion.

The use of digitalis, rosin, gin, and nitre, may relieve the cardiac oppression, and effect a radical cure. Cases are rare indeed in which paracentesis of the pericardium would be justifiable. After the integument is incised, the needle of a pneumatic aspirator may be made to puncture the pericardium with comparative safety between the fifth and sixth intercostal spaces. In the fourth and fifth intercostal space the aperture can be made, though the needle should be directed obliquely downwards as it enters the cavity of the pericardium. Should the diagnosis be correct, and much fluid be present, the point of the needle could do no mischief, for the pericardium and heart are held at a distance from one another by the liquid accumulation. In the event the diagnosis was incorrect or that no fluid was present, the needle-point might inflict a slight wound in the walls of the heart, yet no serious harm would be likely to result.

SECTION XVI.

DISEASES OF THE ABDOMEN.

STOMACH POISONING.

Poisons are not unfrequently introduced into the stomach accidentally, or with suicidal or murderous intents; and the physician is summoned in haste to administer relief after the toxic agent begins to manifest its influence. Under such circumstances all the resources of science that have any bearing upon the case, need to be immediately available. In a majority of instances it is difficult to ascertain seasonably what variety of poison has been swallowed.

Toxicologists have classified poisons according to the natural kingdoms from which they are derived,—as mineral, vegetable and animal; and according to their mode of action upon the system,—as irritants, narcotics, and narcotico-irritants. The mineral poisons are mostly corrosive-irritants, and often prove fatal from the inflammation they excite along the mucous membrane of the intestinal canal. Fortunately most poisonous agents of this class have such an affinity for, or hold such a chemical relation with other agents, that when brought together as they may be in the stomach, though severally poisonous, a chemical union results which is either harmless, or possesses properties not imminently dangerous.

Among the poisons of this class which are best known to the people and, therefore, oftenest used for destructive purposes, may be mentioned, arsenic, corrosive sublimate, antimony, preparations of lead, copper and zinc, and oxalic, sulphuric, muriatic, and other acids. It is not in keeping with the designs of this article to give any thing but a passing notice of these agents as a class.

The symptoms of poisoning by a mineral agent, are those of violent irritation and inflammation along the mucous surfaces they have passed. The most violent gastritis is sure to supervene, and vomiting, retching and purging are accompanying diagnostic manifestations. The mouth, pharynx, and œsophagus are dry and affected with an intolerable burning sensation, which cooling drinks will not assuage. These symptoms generally exist a number of hours, when, if the patient be not relieved, cold sweats and rigors come on, and the termination is fatal.

Poisonous vegetable agents are usually narcotic, and have no *chemical* antidotes; most of them are very active, and exert an extremely deadly influence upon the animal economy. Among the vegetable poisons likely to be used with criminal or suicidal designs, are opium and its various preparations, strychnia, prussic acid, aconite, belladonna, stramonium, conium, savin, and croton oil.

The symptoms of poisoning by most of the above named vegetables and vegetable preparations, are profound narcotism, with a train of varying phenomena, which do not greatly differ from those arising from congestion of the brain. There will be giddiness, vertigo, drowsiness, loss of vision and hearing, dryness of the fauces, headache, nausea, sense of weakness, cold sweat, dilatation or contraction of the pupils, loss or incoherency of speech, delirium, insensibility, coma, and other manifestations varying according to the peculiar poison taken and the idiosyncrasy of the patient. Several of the vegetable poisons, as nux-vomica, conium, stramonium, aconite, belladonna, and some others, belong to the narcotic-irritant class. The symptoms of the first mentioned, (nux-vomica,) and preparations from it, are characterized by convulsive movements, which somewhat resemble those attendant upon tetanus.

The animal poisons liable to be taken into the stomach, are not numerous, nor usually very destructive. The most dangerous of this class is cantharides, which, on account of its reputation among the ignorant as an aphrodisiac, is occasionally administered for base purposes. Its effects upon the alimentary canal and urinary passages are very distressing. The action of the poison is that of a powerful irritant, and excites a violent burning sensation in the throat, with difficulty of deglutition. In time a severe griping will be experienced in the bowels, and blood and mucus will be discharged from them during paroxysms of tenesmus. An overdose of the drug is likely to result fatally. Certain kinds of animal food have been known to produce symptoms resembling those of irritant poisoning. In a majority of instances the effects may be referred more to idiosyncrasy than to any specific poisonous quality in the food itself. However, there are well authenticated cases where a positive poison must have existed in the flesh and milk of animals, as in "milk sickness," a disease not afflicting a single individual who may have partaken of it, but several persons simultaneously, which must preclude the idea of idiosyncrasy.

Certain shell-fish, as lobsters, oysters and mussels, have in numerous instances proved highly poisonous. Whether the toxic effects arise from some poisonous substances the animals have eaten, or from a putrefactive stage they have reached before they are pickled or eaten, is not well established,—undoubtedly both conditions may occasionally exist as causes.

The flesh of the common pheasant during the winter season, when the birds feed on the leaves and buds of the laurel, is known to poison those who eat it.

Pork, sausages, and cheese have all been known to excite symptoms of poisoning, but the noxious influence has been supposed to arise from partial decomposition, or fermentation,—conditions such substances are sometimes liable to before being used as food. Of the poisonous animal substances that are occasionally eaten, few are sufficiently active to destroy life. They are apt to excite disagreeable or distressing sensations along the alimentary tube, and in certain individuals their ingestion will be succeeded sooner or later with an eruption upon the skin. Their irritating qualities often excite copious vomiting and purging, which, fortunately, are salutary effects, as such animal poisons have no antidotes.

No cases in medical practice have more responsibility connected with them than those under consideration. Not only must the physician feel that the patient's life for the time is in his hands, but that a judicial investigation not unfrequently follows the casualty, in which the course pursued, no matter how well advised, will undergo a searching and often perplexing review. And quite too often when the treatment is announced, it is declared to have been inexcusably unreasonable, deficient, or absolutely injurious.

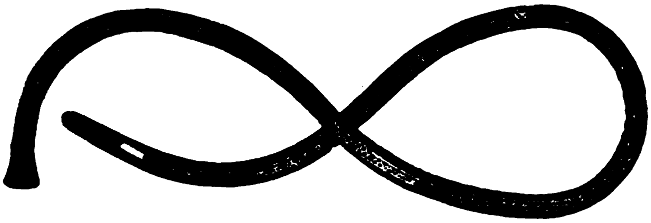
When a mineral corrosive poison has been swallowed, not only is the chemical antidote to be given, but albumen, gluten, milk, and mucilages of various kinds, varying according to those at hand, are to be thrown into the alimentary track, to act as *shielders* to the irritated surfaces. Wheat flour and water can be commanded under almost all circumstances, and will, besides shielding the inflamed surfaces, unite with arsenic and corrosive sublimate, and some other metallic poisons, forming a comparatively innoxious compound, which may be removed by emesis, catharsis, or the aid of the stomach pump. For corrosive sublimate, no better antidote is known than pure albumen; for arsenic, the hydrated peroxide of iron is reputed the best, and on that account is kept ready prepared by apothecaries, and should be by physicians who have not easy communication with the shops where it is sold.

The mineral acids, when swallowed in poisonous doses, may be neutralized with alkaline draughts. It is well, if possible, to avoid the carbonated alkalies, as the disengagement of carbonic acid gas might be so great as to produce injury.

The vegetable poisons as a general thing have no antidotes, and they are to be dislodged from the stomach by artificial means. It will be beneficial to involve them in some glutenous or oleaginous substance to prevent them from being readily absorbed in cases where the means for manual evacuation are not at hand. Emetics are indicated, but they must be such as will act promptly, neither distending nor relaxing the walls of the stomach to any great degree. Nauseating emetics favor absorption of the poison. The mineral emetics, or those which excite vomiting by irritation, as the sulphates of zinc and copper, are far more efficient than lobelia or ipecacuanha. Common table salt, or mustard from the castor, would be far less objectionable emetics than the more active nauseants. The introduction of large quantities of charcoal into a stomach containing organic poisons, from the great absorptive capacity of the material, sometimes proves serviceable.

The most certain mode of evacuating the stomach is by means of what is called a *stomach-pump*, an instrument or combination of instruments that should be within the reach of every physician. The instruments which are gotton up especially for manual evacuation of the stomach are rather complicated and consequently not so rapidly worked as a more simple apparatus. The common œsophageal tube and a syringe constitute an efficient stomach-pump. The tube is constructed like a large bougie or gum-elastic catheter, which has fenestra, or eyes, like those in a theter, near the end to be introduced into the stomach, and an :panded trumpet-like opening at the other end to receive the ›zzle of a syringe. This simple contrivance appears to be the nultaneous invention of Dr. Physick, of Philadelphia, and Dr. onroe, of Edinburgh, and was introduced to the notice of the ofession as early as the year 1800. Since that time various tempts have been made to improve upon the first pattern, yet ithout adding to its general utility.

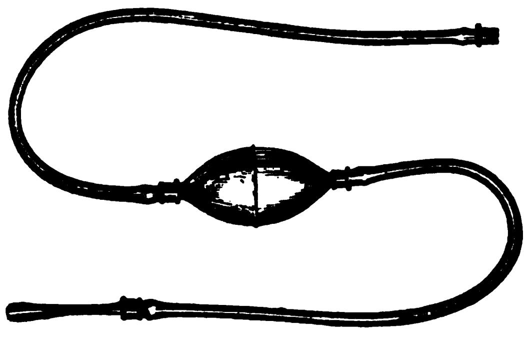
FIG. 154.



Elastic œsophageal tube.

The introduction of the œsophageal tube is not attended with rious difficulties. If the patient be partially or entirely insen- ›le, large cork vial-stoppers may be placed between the jaws, at the tube be not mashed by the teeth during a convulsive ovement. The tube is then to be lubricated and passed rapidly ckwards through the mouth and down the pharynx and œsoph- ;us, there being little if any danger of forcing it into the larynx, through the mucous membrane of the canal. As the tube aches the stomach it becomes caught in a fold of the organ, and e resistance communicated to the hand indicates where it is; so the length of the pipe projecting from the mouth will show e depth reached.

FIG. 155.

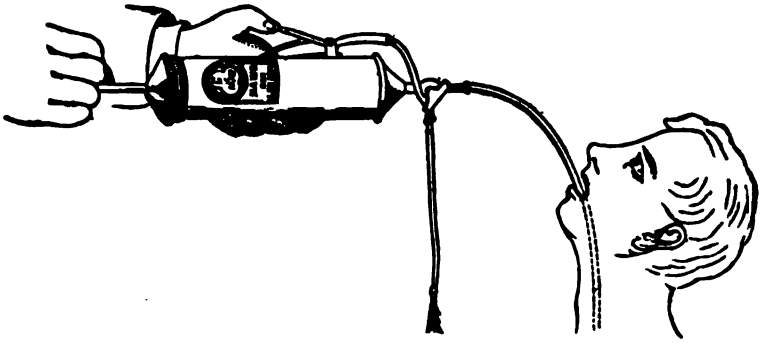


[illegible]son's syringe, which may be used with œsophageal tube to constitute a stomach-pump.

The only obstacle encountered in introducing an œsophageal catheter will be met in the pharynx, the end of the instrument becoming lodged in the sides or posterior wall of that part of the track. But with a little judgment and perseverance no protracted delay need be experienced in passing that portion of the way, as the instrument slides over the back part of the epiglottis, which spasmodically closes, and prevents an entrance into the larynx. Although a choking sensation is excited by the presence of the instrument, the feeling is borne without symptoms of distress.

As soon as the œsophageal tube has been introduced into the stomach, the pipe of a common elastic syringe like the one in the accompanying cut, should be forced into the expanded mouth of the catheter, when from a basin a quantity of water or mucilage, or other diluent, is to be injected through the combined apparatus into the stomach. After one or two pints of fluid have been thrown into the organ in this way, the nozzles of the syringe are to be changed—the suction pipe being connected with the œsophageal tube, and the other placed in another basin—and a quantity of the contents of the stomach, but not as much as has been thrown in, may be drawn out; the fluid obtained in this way being kept by itself for future examination. After one experiment in this way, the nozzles of the syringe are to be reversed, and the process repeated until the stomach is well cleansed, as may be known by the color of the returned fluid, or until all is accomplished that may be with the aid of a stomach-pump. The operation is not considered a dangerous one, yet cases are cited where the mucous membrane of the stomach has been torn by being

Fig. 156.



Ordinary stomach-pump.

violently sucked into the holes of the œsophageal tube by means of a too powerfully worked pump. This undoubtedly happened when the stomach was too thoroughly evacuated.

The stomach-pump is generally to be used in cases of narcotic poisoning when it is impossible to excite vomiting, it being at the same time necessary to empty the organ without delay. This can be done, even if the patient is unconscious. If the brain remain narcotized after the stomach is evacuated, it will be well to use stimulants in various ways. Ammonia may be applied to the nostrils; the fauces may be tickled; the cold douche applied and repeated; diffusible stimulants employed upon the skin, and thrown into the stomach and rectum; and lastly may be mentioned the influence of electro-galvanism.

GASTROTOMY.

The above term literally signifies cutting into the stomach; but from long use and surgical custom, gastrotomy means incising the abdominal walls for the purpose of removing tumors and foreign bodies, and for performing several operations upon the viscera of the abdominal cavity. It was once regarded as a formidable undertaking, but recent experiments have demonstrated that the parieties of the belly may be incised without incurring great risk. Every surgeon of experience has opened the abdomen repeatedly; and if the internal lesion be not serious, a recovery may be expected. Ovariotomy has to be executed by first making an abdominal section, and the Cæsarean delivery is thus performed.

Among the various reports of gastrotomy are some exceedingly interesting cases. M. Labbe, of Paris, Surgeon to La Pitie, gives the following details of a case that came under his treatment:

"March 30th, 1874, a man eighteen years of age, imitating the feats of a juggler, allowed a fork which he was pretending to swallow—the prongs of which he ought to have held by his teeth—to pass deep into the pharynx. During the attempts which were made to extract it with a long polypus-forceps, amidst symptoms of imminent asphyxia, it slipped into the stomach, the patient immediately feeling a sense of relief. He suffered no pain, and was very cheerful; and during several explorations that were made, the fork was only distinctly ascertained to be in the stomach on one occasion. At the end of a fortnight he was seized with violent pains in the stomach, accompanied with repeated syncope; but after twenty-four hours this crisis passed away, and a considerable tumefaction, corresponding to the great end of the stomach, was observed. Considerable pain followed each meal. From this time he alternated between complete ease and a moderate amount of suffering, and in June he returned to his friends in Burgundy. While there he had at first recurrences of considerable pain, which lasted about a fortnight, during which time he was obliged to keep lying down on his left side, the intervals of ease lasting about a week."

In June, 1875, he repaired to Lyons for advice, and remained there for a month; and after his return to Burgundy his health became quite satisfactory, the pains almost completely disappearing. In October, he returned to Paris, and resumed his employment for six weeks, after which the pains returned with violence, and his health became much shattered. He now consulted surgeon Labbe as to the propriety of the performance of a surgical operation. By means of certain manœuvres he was always able, and especially when the stomach was distended with food, to bring the prongs of the fork against the boundary line of the hypogastrium and the epigastrium, so that they could be felt through the walls of the abdomen. As the foreign body had always kept the same position since the time of the accident, M. Labbe thought well of the chances of an operation, and M. Gosselin and Baron Larrey also sanctioned it. Caustics were employed as a preliminary, in the hope of producing adhesions extending from the interior inwards, but when the operation was resorted to on April 9th, 1876, rather more than two years after the accident, these were found entirely absent.

M. Labbe, to prepare for the operation, executed it upon several dead bodies in order that he might make the incision with the least danger. The opening in the abdominal walls was made over the middle of the stomach, and transversely to the body. Blood was kept out of the wound, and the stomach, before an incision was made into it, was attached to the traumatic surfaces by eight points of suture. On the incision being made into the stomach the fork was readily felt, though extraction could not easily be made, inasmuch as the finger was grasped by the aperture as by a vice. When, however, the mucous membrane had been everted and fixed along the whole circumference of the stomachal wound, all difficulty ceased and the fork was seized by a long polypus-forceps with curved extremity, detached from amidst a mass of fungous tissue which surrounded it, and made to project through the wound. Some threatenings of peritonitis were averted by the application of collodion to the abdomen; and under the use of iced champagne the patient's strength soon became re-established. On the fifth day he began to take solid food, and gradually resumed his ordinary diet.

In conclusion, M. Labbe remarks: "The successful termination of the operation seems to be due to several conditions. I attribute it to the operative procedure adopted, founded on very exact knowledge of the 'landmarks'; to the precaution I took of fixing the stomach to the abdominal parieties before opening it; and to the conservative treatment, especially the employment of so thick a layer of collodion as to render the walls of the abdomen and the digestive tube itself immovable, while submitting them to a very firm compression. By means of the compression the character of the respiration was very decidedly modified, the diaphragmatic having been converted into an upper costal respiration."

Chelius' surgery recounts several cases of successful gastrotomy for the removal from the alimentary canal of bodies swallowed.

On the 29th of May, 1635, a young man in attempting to produce vomiting with the handle of a knife, let it slip from his fingers and pass into his stomach. He was much frightened, but able to go about his usual occupation. It was, however, determined to remove the knife by an operation, which was executed on the 9th of July following by a surgeon and lithotomist, named Shoval. "A straight incision was made in the left hypochondrium, two finger's breadth under the false ribs; first through the skin and cellular membrane, then through the muscles and peritoneum. The stomach subsided and slipped from the fingers, which prevented it from being immediately seized, but it was at length caught hold of with a curved needle, and drawn out of the wound. A small incision was then made into the stomach, the foreign body was thus seen, felt and extracted through the wound. The stomach immediately collapsed; the wound in the abdomen was closed with sutures, and the patient completely recovered." Although this operation was performed more than two hundred years ago, it seems to bear every mark of being authentic; hence the recent operation of M. Labbe is not so novel and remarkable as the Parisian surgeons would have us believe. The fact that the aperture made in the walls of the stomach by M. Labbe, grasped his finger so tightly that he could not use it, shows that the suturing of the edges of the gastric wound to the borders of the opening made in the abdominal walls, may not have been so important as M. Labbe supposed. In Shoval's case no precaution was taken to prevent the contents of the stomach from escaping into the peritoneal cavity; and the result indicates that such provision is not absolutely necessary. Although I feel like commending the course pursued by M. Labbe, I am far from being convinced that the establishment of a temporary gastric fistula was an essential feature in the case.

The *Lancet* for 1828 contains the following report in a condensed form: "A lady at Bordeaux, twenty-four years of age, inadvertently let a small fork slip into the throat; it was swallowed, and descended into the stomach. Here it remained for some months, hardly producing any symptoms; but at the end of this period the most violent vomiting came on, and soon brought the patient into a most dangerous condition. By the advice of MM. Delpech and Fages, gastrotomy was performed by M. Cayroche. The fork was easily extracted, and within twenty days the wound was completely healed." If other cases had not been reported this would have been provokingly short; as the case stands, the brevity is laudable.

The *Medical Examiner* for 1835, published at Columbus, Ohio, contains a report as follows: "L. Bates, whose residence is at Wapello, twelve miles from this city, during a drinking bout, swallowed, on a wager, a bar of lead ten inches long and weighing a pound. Thrusting it far down the œsophagus, it slipped from his grasp, and immediately entered his stomach. Dr. Bell was sent for at once, but as Bates had formerly been a juggler, the doctor, thinking he was at some of his tricks, refused to go. Bates, not much concerned at the non-attendance of the physician, worked for three days in a pork-house, with but little inconvenience. During the night of the third day, however, he was seized with great pain in the stomach, accompanied with shooting pains along the spine, extending from the lumbar region to the sacrum, thence to the hips. The next day he walked to Columbus, a distance of six miles, and sent for Dr. Robertson, the oldest physician in the county, to attend upon him. Dr. R. requested Dr. T. B. Neal to see the case with him. On the 3d of June, the tenth day after the accident, the severe gastric pain again returned, accompanied with vomiting and other symptoms of gastritis.

"The operation of gastrotomy was now resolved upon. Dr. Bell, of Wapello, performed the operation by making an incision through the walls of the abdomen, from the umbilicus to the false-ribs, four inches in length, and two inches to the left of the median line. The peritoneum being divided, Dr. Bell introduced his hand, and pushing back the protruding intestines, found that the bar of lead was nearly perpendicular, the upper end inclining a little to the left. The bar was pushed up, until the lower end came opposite the abdominal opening. It was then seized, and an incision made in the walls of the stomach just large enough to admit of extraction with forceps. The contraction of the muscular coat of the stomach caused the incision in the stomach to close perfectly and without trouble. The external wound was stitched, and a compress applied. The patient made a good recovery."

This case likewise shows that M. Labbe attached undue importance to stitching the stomach to the traumatic surfaces of the abdomen, which is the point that led me to make these abstracts and comments.

LESIONS OF THE ABDOMINAL VISCERA.

Contusion of the pariecties of the abdomen, attended with rupture of one or more of the viscera, is common enough to clothe the subject with interest. There is a popular notion that sudden death may follow a blow on the epigastrium or abdomen, without any external or internal marks of violence being detected after death. The presumption seems to be that the fatal issue resulted from *shock*, or from suddenly beating the breath out of the body. When a lad I was kicked in the epigastrium by a mule, and the breath seemed to be so quickly and violently forced from my lungs that I could not breathe for a minute or two, and then only in short gasps. The sensation was agonizing until a moderate amount of air could be respired, and then the distress entirely ceased. The blow paralyzed the diaphragm, the abdominal muscles, and the respiratory powers of the thorax. The contusion did not amount to much, but the shock came near being fatal. If the diaphragm had been ruptured, the stomach torn, or the liver or spleen lacerated, death would have followed; and if no autopsy had been held, the supposition might have been that death occurred from the *sudden blow.* In injuries of the kind, the fatal issue generally comes from the internal lesion, and the integument may show no ecchymosis, or external signs of violence; though well authenticated cases are on record in which death must have occurred from shock alone, when a heavy blow has been received in the pit of the stomach, and no external mark of violence could be detected. "There is no medical doubt that a person may die from what is termed shock," says Dr. Taylor, "without any marks of severe injury being discovered on the body after death. An instance of this is when a person has been suddenly killed by a blow upon the upper part of the abdomen or on the pit of the stomach, which is supposed to operate by producing a fatal impression on the cardiac or solar plexus. Whether this be or be not the true explanation, the fact itself is undisputed; it is certain that a person may die from so simple a cause without any appearance being produced, externally or internally, to account for death. Convictions for manslaughter have taken place when death has been produced under these circumstances."

Rupture of the stomach in a state of health as the result of violence, is fortunately a very rare occurrence; for the issue is generally fatal. Should laceration take place when the organ is in a state of repletion, food and fluids would escape into the peritoneal cavity and excite inflammation of a rapidly fatal character. Stabs and gun-shot wounds of the stomach have been followed by the formation of fistulous openings, which offered opportunities for drainage, and thus became safety-valves.

Scirrhus of the pyloric extremity of the stomach, is attended with emaciation, persistent vomiting, and obstinate constipation. The epigastrium is tumefied and sensitive or actually painful. The abdomen below is doughy and lifeless. The effect of the general devitalization is apparent in every feature; and death is the inevitable result.

Rupture or perforation of the intestinal tube, the result of external violence, without any external wound, is a lesion of frequent occurrence, and formidable in character. A kick inflicted upon the abdominal walls, is a common cause of intestinal injury. Heavy blows received upon the abdomen, and wheels passing over it, are frequent sources of lacerating injuries of the intestines. The walls of the intestinal track can not be ruptured or forated without the escape of more or less fæcal matter into peritoneal cavity, therefore the prognosis is exceedingly unfavorable. The primary shock is always dangerous; yet when the height of the inflammatory stage is reached, the symptoms are fearful. When an opening is effected in the abdominal walls, at the time the injury is received, the escape of fluids may relieve the patient. The worst feature of a lacerated intestine, no external wound existing, is that there is no opportunity for drainage; consequently it is often desirable to incise the abdominal parieties in order that fœculent and other fluids may be evacuated. When the abdomen is immensely swollen, the peritoneal cavity and the intestines are distended with gases, therefore aspiration would be the best method of relieving the patient. The abdominal walls could be safely incised, and then a fold of intestine is easily punctured with an aspirating needle. The gases will escape as soon as a puncture is made, and the pinhole wound may do little mischief. Great harm usually arises from the early and persistent vomiting, for the effort of retching disturbs the lacerated intestine, and thus helps to empty it. The hypodermic use of morphia is generally beneficial in allaying pain, nausea, and the disposition to jactitate. The swallowing of bits of ice allays the thirst, ice-cream furnishes nourishment, and champagne occasionally proves very refreshing. While these palliative measures are not to be neglected, they are eventually useless unless the abdominal parieties be opened, the distended intestines punctured to let out the gases, and a way made for the escape of feculent and other fluids. And while the opening in the abdominal walls exists, a solution of salicylic acid may be thrown into the peritoneal cavity for the purpose of arresting fermentation. If it can be determined where the intestinal rent is located, the abdominal incision may be so made that a closing of the aperture with sutures may be possible.

Lacerations of the *liver* are generally followed by speedy death, hemorrhage into the peritoneal cavity producing fatal collapse. A slight rent, amounting to little more than a crack in the surface of the organ, might be followed by recovery, but those cases in which considerable laceration has been effected, death has unerringly followed.

An acquaintance of mine fell against the corner of a pile of lumber, and, staggering, reached the ground. He suddenly became pale and cold, and exhibited great vital depression as if laboring under a shock. In fifteen minutes from the reception of the injury he was dead. An autopsy revealed a rent of the liver two inches and a half long, and an inch in depth at the deepest point. Two quarts of coagulated blood were found in the abdominal cavity. There was no external mark of violence; the liver seemed more than usually friable, though not otherwise abnormal. Death takes place so soon after rupture of the liver that it is useless to talk of treatment. Rarely does a patient live more than a few hours. Little can be done except to place the body at rest in a recumbent posture. If only a little blood escapes there may be a possibility of recovering. Opening the cavity of the abdomen could do no permanent good, as the hemorrhage from the liver is the dangerous feature, and there is little hope of arresting the flow of blood.

Rupture of the *gall-cyst* has occurred in several instances, and all turned out fatally. The laceration is usually produced by the kick of a horse, or the punch of a stake; the bile flows into the peritoneal cavity, and fatal peritonitis follows. If it were known at once that the gall-bladder had suffered laceration, it would be judicious to make an opening in the abdomen near the injury, and attempt to turn the bile outwards. It is easy and safe to make fistulous openings reaching to the gall-cyst and bile-ducts in the inferior animals, therefore it would not be unreasonable to suppose that a similar opening could be established in man.

Abscess of the liver is rather common and often fatal. The earlier symptoms may not be observed or correctly interpreted, yet there would be tenderness and fullness in the organ, with some disturbance of the stomach. At length the swelling in the upper part of the abdomen, the discovery of a sensitive and perhaps fluctuating spot, the vital depression, the bilious hue of the skin, the flaccid condition of the integument, and a troublesome nausea, indicate pretty clearly the morbid condition of the liver.

The prognosis in abscess of the hepatic viscus is not favorable. Many cases turn out quite favorably, yet more terminate fatally sooner or later. If the purulent sac bursts and lets the pus into the peritoneal cavity, the issue is commonly fatal at once. Even if a spontaneous discharge into the stomach or duodenum is effected, the result is not always favorable. I have come to the conclusion from observation that a discharge outwardly, through the abdominal walls at some point, is the safest. If it be discovered that a tendency is manifested to effect an outward evacuation at any point, the spot should be poulticed, and an exploring needle should be sent to considerable depth every day, in order to lead the way and hasten the issue. I have pursued this course in several instances, and generally with marked success.

However, it would be hardly justifiable to make an incision in the abdominal walls when there was no sign that an abscess was pointing in that direction. I did so in one instance, making a deep incision near the linea alba, over the region of the epigastrium. The abscess became large and burst into the stomach. Vomiting brought up large quantities of pus mixed with bile and broken down hepatic tissue. The patient died, but seemed in no way inconvenienced by the efforts made to lead the evacuation of the abscess externally. The attempt was simply fruitless.

Injuries of the abdomen may be attended with rupture of the spleen. I once held an autopsy upon a man who died pretty suddenly after being kicked in the left side while engaged in a quarrel. The capsule of the organ was torn and the substance of the spleen lacerated. Two quarts of coagulated blood were found in the peritoneal cavity. It was thought before the post-mortem examination was held that the liver had been lacerated, as the symptoms following the injury were quite like those which follow rupture of the hepatic organ.

The spleen is not exempt from abscess, but the symptoms and treatment being similar to those of abscess of the liver, there is no occasion to repeat what has just been stated. The swelling and tenderness in the left side should be subjected to the influence of poultices or warmth and moisture in some other form; and any manifestation of pointing of the abscess externally should be encouraged by an incision in the skin and the use of an exploring needle. If the abscess breaks into the cavity of the peritoneum the result is likely to be fatal.

Rupture of the kidney may be produced by a kick in the loins, or a severe blow of any kind in the renal region. If the capsule of the kidney be torn, and the cortical substance lacerated, blood will become extensively infiltrated in the loose structures about the organ; and in time will produce discoloration of the skin in the loins. If the laceration be deep enough to reach the pelvis of the kidney, blood will get into the bladder and be voided with the urine. A profound state of collapse attends rupture of the kidney, especially if much blood be extravasated. Vomiting is a frequent symptom, also pain in the loins, and irritability of the urinary organs. Retraction of the testicle on the side injured and pain in the spermatic cord may be expected. Vermiform coagula—casts of the ureter,—will be passed with the urine.

Rupture of the kidney is generally fatal a few days after the injury is received, and often in a few hours, yet in one case reported the patient lived eighteen months, dying at last of cystic disease of the kidney and general anasarca. An autopsy revealed a faint trace of the ruptured line; and the function of the kidney seemed to have been completely obliterated, as the ureter was impervious.

The treatment in a case of rupture of the kidney should be rest imposed, with gelseminum, chloral, and other anodynes. The hypodermic use of morphia in the lumbar region would be the best way to insure quietude. In the event that the laceration was slight, the patient might recover.

Nephritis is not an uncommon affection, and in bad cases it is grave in character. The causes are injuries, exposures, excesses of various kinds, diuretics employed to an abusive extent, calculus, and sympathetic affections of the ureters, bladder, and urethra. The symptoms are, pain in the loins, rigors, nausea, frequent micturition, fever, great depression of the vital forces, scanty and acrid urine, and tenderness in the iliac and femoral regions.

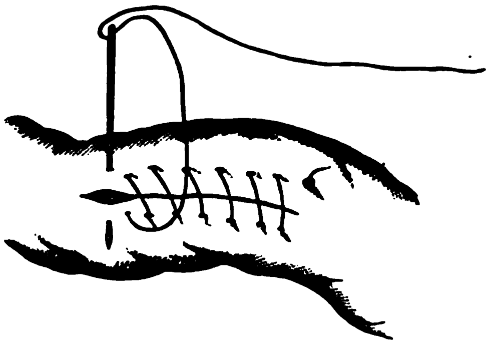
The treatment consists in rest, a soluble state of the bowels, a wet compress to the loins, gelseminum, pinus canadensis, and the subcutaneous use of morphia and atropine. There is no indication for diuretics. The diet should be light and free from stimulants. Neuralgia of the kidney is to be managed in about the same manner.

Abscess of the kidney is somewhat rare, yet may be a sequence of nephritis or the irritation of a calculus in the pelvis of the organ. The symptoms of a forming renal abscess may be similar to those of ordinary nephritis and of other diseases of the kidney. The pain is very severe, and extends to the groin, genital organs and thigh. When pus has been produced, it may find its way to the pelvis of the kidney, and escape with the urine, but this is not a common result; the abscess is more likely to form beneath the capsule, and after accumulating until it bursts its barriers, finds its way downward by gravitation. It may reach the groin, and seek escape there. Should it seek escape through the loins or lumbar region, the use of poultices and an exploring needle might hasten the period of evacuation with the knife. In the event that an opening is made in the loins for the evacuation of an abscess of the kidney, and a calculus present itself, its removal with scoops and forceps would be entirely proper, but the operation has no just claims to be designated nephrotomy. In a given case which was diagnosed as calculus of the kidney, with no signs of abscess, a surgeon might feel justified in carefully dissecting a passage through the posterior lumbar region to the kidney, with the expectation of being able to grasp the stone and remove it; and if he should succeed in his operative procedure, he might justly claim to have performed nephrotomy.

Hæmaturia is a common affection in men past the meridian of life, and the cause of the hemorrhage is not always plain. The bladder, prostate, and urethra, may give off blood, but a true hæmaturia is restricted to a fault in one or both kidneys. An acquaintance of mine who was in feeble health, yet able to attend to business, was run against by a boy at play, and in a few minutes he passed a large quantity of blood. Under the influence of rest, gelseminum, pinus canadensis, and iron, the patient rallied rapidly, and claimed to be better than for a long while. Six months afterwards he was on a railroad train that sustained a wreck; and the shock and concussion of a sudden check of speed started afresh the hæmaturia, from which he never fully recovered. His bodily powers gradually gave way, and in two months he died. Although he had not been my patient, I had diagnosed his case as that of cancer of the kidney, and an autopsy revealed carcinoma of the right renal organ. Another acquaintance of mine suffers an attack of renal hæmaturia every summer, and he claims it takes the place af a "hay fever" he once endured, but now has lost.

Surgical operations performed for the removal of uterine and ovarian tumors, have established the fact that large openings made in the abdominal walls are not so dangerous as ordinary stabs that reach the peritoneal cavity, hence there should be no hesitation iu enlarging a small opening if such a course seemed necessary to arrest internal hemorrhage, to remove a clot, or to cleanse the abdominal cavity when coagula of blood and fœcal matter are known or suspected to be there. When it is apparent that a rent has been made in a fold of intestine, an incision should be made in the walls of the belly large enough to close the opening in the bowel with sutures: and after the operation has been performed the aperture in the abdominal walls is not to be entirely closed, but free drainage should be provided for. A solution of salicylic acid may be injected into the peritoneal cavity, to obviate fermentation of the serous and sanguineous fluids. If considerable liquid be known to occupy the abdominal cavity, it is well to insert a catheter in the wound, and endeavor to draw off the fluid. I have employed a stomach-pump to effect evacuation, the end of the œsophageal tube being introduced through the aperture in the abdomen. If the intestines become distended with flatus to a dangerous extent, an aspirating needle may be used to let off the gas. The puncture in the intestinal wall is so small that no harm is done by repeated use of the needle.

FIG. 157.



Glover's suture with silver wire, to close a wound of the intestine.

A rent in an intestine is to be drawn together with what is called the Glover's suture, fine silver wire being used to make the over and over stitch, or continuous suture, and both ends of the wire are to be left on the inside of the bowel. This can be done by starting the seam with the knot or coil of wire on the mucous coat, and ending by cutting off the wire at the other end of the seam, and sending its terminal extremity through a puncture made purposely for it. The wire may remain for years without producing irritation, or it may gradually slide along until it drops into the intestine and harmlessly passes out of the anus. While the healing process is going on, such nourishment should be employed as will furnish as little fœcal matter as possible. Ice-cream, corn-starch, and beef-tea, may be employed as aliment. If the rent in the bowel be small, no sutures need be employed. Cases treated without sutures have done extremely well, especially when no retching or efforts to vomit intervene. If morphia be employed hypodermically every eight or ten hours, the rmicular motion of the intestines is very much restrained. hen the edges of the intestinal wound rest in contact the union very rapid, two or three days being enough to secure quite firm blending of the incised walls.

In the event that a fistulous opening follows an abdominal and testinal wound, little fæcal matter may escape, and the apere may at length close altogether. If the downward passage small, it may be enlarged by the use of bougies. A sponge ked in a weak solution of carbolic acid may be worn over the ture to absorb feculent fluids that find their way through istulous opening.

bscess originating in the walls of the abdomen, or in the eritoneal cellular tissue, is not very common, and when it occur, evacuation of the pus generally takes place outly and without serious consequences; but when the abscess es from disease of bone, the prognosis is unfavorable. In case that came under my observation feculent matter was harged with the pus, clearly indicating that an opening in alimentary canal communicated with the sinus that led from rious vertebra to the outlet in the abdominal walls. The ient eventually died ftom Bright's disease of the kidneys.

The most frequent seat of abdominal abscess is in the region the ilio-cœcal valve—the right iliac fossa. Possibly the apndix vermiformis is the origin of the inflammatory action, and e lodgment of a piece of bone or fruit-stone may be the cause. man who was fond of shooting and eating birds was suddenly tacked with severe pain in the right iliac region while on a gunng excursion in the fields. He suffered great distress while ing home, and, in fact, for the two days that he afterwards ed. An autopsy revealed an abscess of the cœcum which was ovoked by the presence of thirty bird-shot in the vermiform pendix. The shot were swallowed while buried in the flesh of ds, and their weight led to their lodgment where they provoked fatal difficulty.

In Sept. 1874, I was called to a German farmer who was sufferg terribly in the region of the cœcum. The parts were indued and swollen; and pressure produced agonizing pain. I gnosed the case as nascent abscess of the cœcum, and gave an favorable prognosis. The general symptoms were those pret in strangulated hernia, or intussusception of the bowel. Howr, I poulticed the tender spot, and administered morphia hypodermically. On the second day the patient was easier, but exhibited great vital depression. To favor an outward discharge of pus as soon as it formed I made an incision in the walls of the abdomen to the depth of half an inch, and sent an exploring needle a half inch deeper which must have reached the cœcum. I ordered the wound and adjacent region poulticed continuously until I returned. As the patient lived several miles in the country I did not visit him again for two days. Just before I arrived at the house the abscess broke into the intestinal track, and a gallon of purulent and feculent fluid discharged *per anum*. The patient made a rapid recovery without the intervention of an unpleasant symptom. Although the wound made in the abdominal walls did not induce the abscess to discharge outwardly, it did no harm; if the tendency had been to discharge outwardly, the incision would have hastened the evacuation, and prevented a burrowing of the pus between the abdominal muscles, as it sometimes does when a precautionary incision is not made.

In the *Transactions of the London Pathological Society* is recorded a case, in which perforation of the cœcal appendix was occasioned by the impaction in it of an intestinal concretion. Another case is detailed in which a fistulous orifice in the abdominal parieties opened into a circumscribed cavity, which communicated with the interior of the colon and duodenum, and indirectly with the gall-bladder. This was probably the result of a gall-stone ulcerating into the duodenum, and accidental rupture of the colon.

Obstruction of the intestinal track is quite common, and the causes are numerous. The symptoms of intestinal obstruction are generally severe and highly dangerous, unless speedily relieved. Partial obstructions from the pressure of a tumor, or from adventitious bands that sometimes follow ulceration of the bowels, and a strictured condition of the intestinal canal at some point, may prove exceedingly inconvenient and even troublesome, yet not shorten life. Complete obstruction from invagination and strangulation, is absolutely fatal unless relieved, and often the morbid condition is permitted to exist until relief is impossible. A cancerous condition of the alimentary track produces obstructions more or less complete, and death eventually ensues from a complication of difficulties. Congenital malformations of various kinds may obstruct the intestinal canal, and are rarely amenable to treatment. Foreign bodies may lodge at some point along the intestinal track and prove serious obstructions. A fragment of bone accidentally swallowed may lodge in the cœcum or rectum, and establish ulceration, or produce perforation of the intestinal walls. A twisting of the sigmoid flexure of the colon has been attended with incarceration that proved fatal, the obstruction being complete and unyielding. Impacted fæces have frequently formed obstacles in the alimentary canal that were overcome with difficulty. The treatment for many forms of intestinal obstruction is to anæsthetize the patient, introduce a flexible enema-tube into the rectum, and even into the colon as far as practicable, and then distend the bowel with injections of warm water. If a repetition of such endeavors fails to relieve, the abdominal parieties may be laid open, and the difficulty overcome by manipulating the disordered part. It is generally bad practice to administer cathartics in cases of intestinal obstruction.

Invagination or intussusception of the bowel may occur at any point of the intestinal canal. The difficulty consists in an inversion or *involution* of a portion of intestine, a part above slipping into the tube of the gut immediately below, as a portion of a glove-finger may be made to slide upon the part that is held fast. The involution of a piece of intestine is generally produced by the action of ascarides in the alimentary canal, though the accident has occurred from other causes. But happening in whatever manner, the difficulty is rarely relieved, and death occurs from peritonitis, or gangrene of the parts involved in the invagination. The symptoms of intussusception are those of strangulated hernia, and *a discharge of bloody mucus from the anus.* Spontaneous recovery has taken place in several instances from the sloughing of the invaginated portion of intestine, as indicated by the discharge of several inches of bowel from the anus. The only rational treatment for intussusception seems to consist in reducing the vermicular action of the intestines with opium or chloral, and distending the bowel below the obstruction with warm water introduced through an enema-tube. If the abdomen be laid open, the invagination could not often be overcome without using force enough to endanger tearing the bowel. It has been suggested that a strong man place the patient's feet on each side of his neck, and while the head and trunk hang low behind his back, he impart several jerks to the sufferers' body, the gravitation of the viscera in a direction the reverse of what they usually tend, exerting, or is presumed to exert, disengaging [illegible] farmers who have sheep affected with [illegible] them in this way, and sometimes successfully. [illegible] deemed advisable to make an opening in the [illegible] intussusception, or to overcome other [illegible] it is generally best to make an incision [illegible] the median line, below the umbilicus, [illegible] when the peritoneum is incised that a [illegible] intestine is not wounded. When the peritoneum is [illegible] process of incising the abdominal walls, it is best [illegible] it with forceps and make a slight nick in it, to allow [illegible] of a grooved director, before the incision is extended; [illegible] as the aperture is large enough to admit two fingers [illegible] the best guide for the use of a probe-pointed bistoury [illegible]ering the wound. The hand is to be introduced into [illegible] abdominal cavity for the purpose of exploration, and as the [illegible] intestinal mass is gently moved by the wound, a highly vascular [illegible] brought into view may be the sign that leads to the seat of [illegible]struction. Another feature is a thickening of the intestine at [illegible] the point, and a fæcal accumulation above it. After all has [illegible]en done that may be, the wound in the abdominal parieties [illegible] be closed with silver sutures. However, an opportunity is [illegible] given for drainage, and the introduction of a catheter or [illegible]er tube to facilitate the evacuation of fluids that may accumulate in the peritoneal cavity.

[illegible] permanent obstructions of the colon or rectum, generally [illegible] cancerous deposits, life may be prolonged by establishing an artificial anus in the loin or lumbar region. The operation was advocated by Callisen, and put in practice by Amussat. The colon is to be reached where it is uncovered by peritoneum, and where it lies anteriorly to the quadratus lumborum muscle, and is merely separated from the muscle by cellular tissue. The operation may be performed on either side of the body, as it may be desirable to reach the ascending or descending colon. The location of the external incision, in either loin, is between the last rib above, and the crest of the ilium below. The colon in this part of the lumbar region, is fixed to the abdominal wall by the reflections of the peritoneum, and lies loosely in contact with the quadratus lumborum. The kidney is above the main part of the incision. There is no meso-colon where the intestine is to be opened. The incision leading to the colon, according to Callisen, should be vertical and in front of the longissimus dorsi muscle;

but Amussat operated by making a transvere incision, commencing in front of the longissimus dorsi and ending six inches in advance, towards the median line of the abdomen. The advantages of the transverse incision are that, 1st, it makes the operation easier and more certain, and avoids the danger of dividing the lumbar vessels and nerves; 2nd, it facilitates finding and opening the colon without wounding the peritoneum; and 3rd, it enables the operator to establish the artificial anus at a point more anteriorly than the vertical incision will permit.

The operation of Amussat is not difficult to perform. The skin, fat, and fascia are boldly divided down to the muscles, and aponeuroses, and then these are to be carefully divided, the grooved director being employed to raise the different layers. At length the areolar tissue between the abdominal walls and the colon is reached, and the finger explores the relations of structures. The colon, if loaded, as it generally is, presents its *muscular surface* in the bottom of the wound, *uncovered by peritoneum.* The bowel is to be grasped with long-toothed forceps and carefully dragged into the wound, when it is to be secured with silver sutures, and opened to complete the establishment of an artificial anus. At first a gush of flatus and fluid feculent matter takes place, therefore before the colon is opened a basin should be in readiness to catch what may hurriedly escape.

The usual method of controlling the discharge of fæces through the artificial anus is by the use of an ivory ball attached to a small shield, over which a soft thick piece of india-rubber should be fastened externally; and this maintained in position over the wound by a bandage. The ball should fit the opening in the bowel in order to secure cleanliness. At certain times the retentive apparatus is to be removed, and a basin used to catch the evacuation, which is similar to ordinary defecation.

The late Dr. Blackman, who performed the operation several times, spoke in favor of its advantages in prolonging valuable life, but Dr. Gross uses the following language in regard to the operative procedure: "He had performed the operation but once, and nothing could ever induce him to attempt it again; it was founded upon misdirected sympathy, and ought to be discarded as among the obsolete devices of surgery."

ASCITES.

One of the common sequences of morbid action is a collection of serum in the peritoneal cavity; the accumulation is called ascites, and in popular parlance, dropsy. The effusion most generally results from heart, liver, and renal affections; a condition of anæmia is attended with œdema of the cellular tissue of the lower extremities, and dropsical accumulations in the serous sacs. Embolism of the arteries, and obstructions in the veins, are frequent causes of ascites and œdema.

Anasarca, or general dropsy, is understood to be an infiltration of serous fluid into the areolar spaces and serous cavities of the body; and is characterized by tumefaction, sallowness, coldness, and loss of elasticity in the integument and deeper structures of the organism. A loss of balance between the exhalents and absorbents, the latter being unequal to the former, leads to an œdematous state, either locally or generally; yet there is commonly some lesion or morbid condition that leads to a disturbance of the equipoise. A ligature placed upon a limb obstructs circulation, especially the venous, and thereby favors a transudation of the watery parts of the blood into the adjacent cellular tissues. Besides, the blood itself may become thinned through faulty nutrition, so that its more liquid parts may be strained through the vascular coats, especially after a laxity of fibre is established in the walls of vessels.

Dropsy is often a sequence of scarlatina and measles, but as such it is rare that tapping is performed as a method of relief, though there is no valid objection to the operation when therapeutic means fail.

Induration of the liver, as well as hypertrophy of the organ, offer an impediment to the venous circulation, and as a result an anasarcous condition follows. Enlargement of the spleen is also a cause of abdominal dropsy. Diseases of the kidney are fruitful sources of anasarca; Bright's disease is sooner or later attended with general dropsy which is incurable.

The treatment of ascites and anasarca should vary with the cause, therefore no single plan of medication will benefit all cases. Hypertrophy of the heart, with valvular derangement, might improve under the influence of digitalis or apocynum; an indurated or hypertrophied liver generally improves under the administration of sulphur; and some forms of renal disease are benefited by the use of "acid solution of iron." As dropsy is usually a

ptom or sequence of visceral disease, there is no propriety
reating it as a primary affection. The usual plan of mana-
g cases of dropsy has been to prescribe "hydragogue cathar-
" and diuretics; and while improvement might be appre-
le in many instances, the prescriber would be little the wiser
he experience.

n cases of anasarca, or general dropsy, the integument of the
, penis, scrotum, and abdomen, being distended almost to
ting, and no plan of medication relieves the unpleasant con-
n, it is serviceable to puncture or scarify the skin sufficiently
llow a considerable portion of the serum to drain off. I have
n patients great and permanent relief by making punctures
hort incisions in the integument of the legs and genitals.
ome instances the small apertures in the skin thus made will
open, and discharge for weeks and even months. It is rare
any harm arises from this plan of establishing drainage or
lual evacuation. I have made the punctures with a Glover's
lle; and a patient raises less objection to the little imple-
t than to a knife or scarificator.

PARACENTESIS ABDOMINIS.

is often necessary to tap the abdomen in order to get rid of
tes. Although the timid and the ignorant object to the opera-
on the plea that one tapping entails a succession of similar
ations, the objection is not well taken. I have performed
centesis abdominis in several instances when the evacuation
ved the viscera of the abdomen so much that medication
ed ascendency over the disease, and a repetition of the tap-
was not required. When paracentesis is performed merely
palliative in cases of ascites dependent upon incurable dis-
, the operation is performed merely to afford temporary relief;
it would be unreasonable to expect anything more; and the
ator would hold out no other promise.

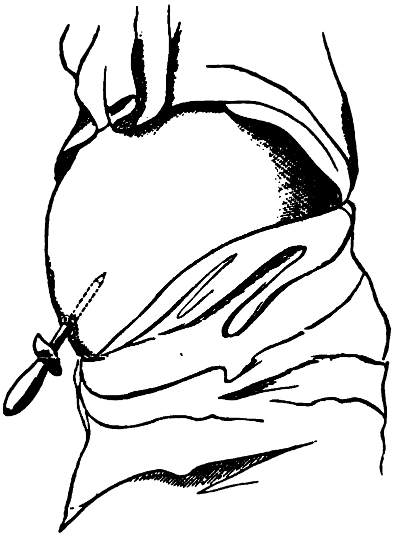
efore performing paracentesis abdominis it is essential that
presence of a large quantity of fluid in the peritoneal cavity
liagnostically determined upon. It is a serious blunder to
cture the abdominal walls to relieve ascites when no consid-
le amount of fluid is present. Some children have protu-
nt abdomens which an unwary physician might take for
ical accumulations. A medical man of my acquaintance
nged a trocar and canula into the protuberent belly of a

the [illegible]
som[illegible]
gr[illegible]

A [illegible]
of [illegible]
bo[illegible]
and [illegible]
the [illegible]
[illegible]

ance of the hands, the fluid is all evacuated. If the patient grows faint while the discharge of serum is going on, a finger may be applied to the mouth of the canula until resuscitation is brought about. A stimulant—wine or brandy—may be employed to revive the patient. However, re-action will soon occur, if nothing stimulating is employed. The patient should not look upon the flowing fluid; and the head and shoulders may be lowered if faintness comes on. The operation is not painful: even a sensation of relief attends the discharge of fluid. The knife in making the slight incision in the skin produces more pain than the plunge of the trocar.

FIG. 158.



Tapping the abdomen with a trocar and canula.

I have sometimes attached a piece of rubber hose to the mouth of the canula in order to convey the escaping fluid to a vessel at the foot or side of the bed. A common cylindrical trocar is as good as any; and an instrument of good size and simple construction is generally preferable to a small and complicated affair.

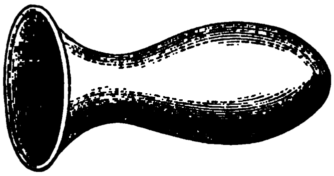
During the evacuating procedure the canula may be obstructed by a flake of lymph or floating fold of intestine, therefore it is proper to carry a probe or elastic catheter through the tube for the purpose of re-establishing the flow; but when it is apparent that nearly all the fluid has escaped, movements of the canula and the introduction of probes might irritate delicate structures within the abdomen. However, when considerable fluid remains, and the flow nearly ceases, it is well to change the position of the patient, or compress the lateral walls of the lower part of the belly with the hands. By doing this a quart or two of additional fluid may be made to escape through the canula.

Ordinarily there is no danger, while performing paracentesis abdominis, of wounding the bowels, for the mesentery holds the intestines close to the vertebral column, and the large quantity of fluid in the cavity of the peritoneum pushes the abdominal walls forward; consequently the interval between the entering trocar and the viscera of the abdomen is considerable. However, as accidents have happened, it is well for the operator to be cautious about tapping the abdomen until he has made a careful diagnosis. If any tympanitic resonance is to be discovered below the umbilicus, it is safe to postpone the operation until the diagnostic signs are more favorable. I knew a case in which an abscess of the liver presented signs of ascites, and the surgeon did not discover the mistake until pus and biliary matter flowed through the canula. An autopsy a few days afterwards revealed the fact that the sac of the hepatic abscess extended below the umbilicus. Fibroid tumors of the ovaries and uterus have been punctured with a trocar, under the misapprehension that ascites existed.

The peritoneal cavity is occasionally the seat of hydatid cysts, which in their development simulate ascites in many respects. In the course of eighteen months I tapped a large cyst of this kind sixteen times, and drew off from three to four gallons of a ropy fluid at each operation. It was plain after the abdominal walls had been rendered lax by emptying the largest cyst, that numerous smaller sacs existed. At length the woman died from the bursting of a cyst containing pus, which seemed to spring from the peritoneal investment of the liver; and a post-mortem examination revealed millions of minute cysts, and several ranging from the size of a playing marble to that of a large orange; two were as big a child's head. Some of the larger cysts contained smaller ones and a quantity of colloid material, too thick and tenacious to be evacuated through a common canula. The large cyst which had been evacuated so often, contained fluid which from its consistence would flow the most readily. The patient was not confined to her room a day by any of the tappings, and frequently prepared a meal and ate heartily an hour after an operation.

So rapid is the accumulation of serum in some instances, and so inconvenient has it been to tap often, that I have employed a leaden catheter, bending it to a form that would stay in the wound, to draw off the fluid as fast as it accumulated. I have also employed a leaden plug shaped like the one in the accompanying drawing, though perforated several times on its oval end to allow the fluid to find its way into it. The shape is favorable for introduction and retention. An Italian patient of mine wore such a drainage apparatus for two years. He used a cork stopper in the external open end of the tube, to prevent a constant dripping from wetting his clothing. He would withdraw the cork twice a day and draw off six or eight ounces of fluid each time.

FIG. 159.



Self-retaining plug.

Sometimes I close the wound in the abdominal walls at once with a compress and strips of adhesive plaster; and the opening heals quickly and kindly; but in cases where the fluid accumulates rapidly I allow the drainage to continue through the puncture the trocar has made, as long as it will. Occasionally a leakage would be maintained for two or three weeks. In the event that many tappings are repeated there may be some variation made in the spot selected for the puncture, going above, below, and a little to one side at each repetition. Paracentesis may be performed through the linea semilunaris, especially when it is desirable to evacuate an hydatid cyst that is located considerably to the right or left of the median line.

HERNIA.

The protrusion of any viscus through a natural or preternatural opening is called hernia. There may be hernia of the brain through an aperture of the cranium occasioned by fracture; hernia of the lung through a chasm of the thoracic walls; and hernia of any of the abdominal viscera through an accidental rupture of the parieties of the belly, or through the natural openings, as the umbilical, inguinal, and femoral canals. In common parlance hernia is denominated " rupture," as if the protrusion or escape of internal parts was effected by the breaking or tearing of the enclosing medium.

But, inasmuch as nearly all hernial protrusions occur through natural canals in the abdominal walls, such will receive the attention their frequency commands. Although some of the abdominal viscera may protrude into the thoracic cavity, through a rent in the diaphragm, the accident is so rare that little need be said concerning such a lesion.

The commonest varieties of hernia are inguinal, femoral, and umbilical; and both sexes are liable to either of these affections, though not in equal proportions. Males are afflicted with hernia about four times as frequently as females, the preponderance arising in a great measure from the greater physical exertions endured by the hardier sex.

Age has an influence upon the numerical proportion of hernia in the sexes. In the first five years of life five males are ruptured to one female, while between twenty-five and thirty the relative proportion is reduced to three cases in males to one in females. From thirty to fifty years of age two males to one female are ruptured; and from that period to the end of life there is a certain proportionate increase of hernia in males as compared with females.

All persons, in whatever station or condition of life, are liable to hernia, though the laboring classes suffer most frequently, because they are subjected to influences which beget hernia; and the most laborious occupations tend to develop the lesion. Undue physical exertion involves a liability to hernia.

Hereditary influence has something to do with hernial lesions, the tendency arising from a faulty conformation of the ventral orifices; thus, abnormally large umbilical openings and inguinal canals would predispose to hernial protrusions, and an unusual elongation of the mesentery would increase the liability to hernia; and both of these anatomical peculiarities might be inherited. Other structural conditions of anomalous character may be determined by hereditary influences.

A relaxed state of the mesentery which may be produced by debility, and a lax and open condition of the ventral orifices, brought about by straining and coughing, establish a predisposition to hernia. Persons of a constitutionally weak state of body, whose fibrous tissues are deficient in tone and power, are more liable to hernia than the robust, though they scrupulously avoid the outlay of strength which the strong enjoy.

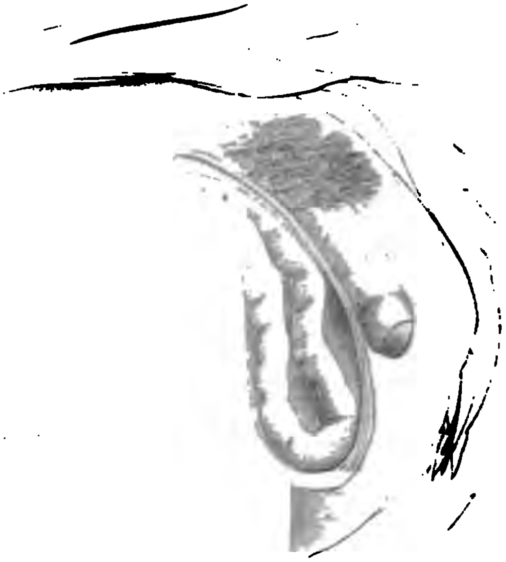
There is a constant antagonism existing between the contents of the abdomen and the muscular walls which enclose the viscera. "The gaseous and fluid distension of the intestinal tube exerts an ever variable pressure against the abdominal parietes, whilst they, in their turn, react upon the inflated viscera; thus between these opposing forces a sort of equilibrium is maintained." The balance is destroyed when the enclosing walls are no longer able to resist efforts of the viscera to escape at some weak point.

The immediate cause of hernia is generally attributable to strained attitudes and postures of the body, and to spasmodic muscular exertions. Lifting, wrestling, coughing, sneezing, gesticulating, and other violent physical exertions, may be named as common causes of hernia, though the instances are not few in which the visceral protrusion begins so gradually and painlessly that the hernia is not perceived until noticeable from its size.

Those parts of the abdominal viscera which are permitted by their peritoneal attachments to move about with the greatest freedom, most frequently protrude through apertures in the walls of the belly. The small intestines and the omentum constitute such floating viscera, hence they oftenest form the contents of a hernial sac. In rare cases the stomach and spleen have partly escaped through openings in the abdominal walls.

The signs of hernia may be plain or obscure. When a child has a fullness at the umbilical opening, and the swelling increases while crying or straining, and subsides when in a state of repose, the tumor is unquestionably hernial; and a marked fulness of the inguinal region, which can be easily made to disappear under pressure, or which retreats when the individual assumes the recumbent attitude, is more likely to be hernia than anything else. The same distinctive features indicate femoral hernia when the swelling is just below the linear boundary between the thigh and abdomen. An upright posture, and a forcible descent of the diaphragm, as in coughing, augment the size of a hernial tumor.

Ordinarily there is little danger to life arising from hernia, especially if the viscera inclined to protrude be kept inside the [illegible] the protruding [illegible] retaining apparatus [illegible] is placed in [illegible] may come on at any



[illegible] intestine exhibited in the scrotum.

[illegible] somewhat technical, has been [illegible] of surgery, for the purpose of des- [illegible] tumors, the place of exit from [illegible] structures implicated or involved in the [illegible] protruding knuckle of intestine constitutes [illegible] portion of omentum protrude, epiplocele or [illegible] expression employed to designate the kind [illegible] intestine and omentum escape together [illegible] the complication is called entero-epiplocele. [illegible] through the umbilical opening is [illegible] omphalos or omphalocele; the escape of viscera [illegible] walls of the belly is commonly rmed ventral [illegible] the exit is through the external ominal ring, [illegible] is the name given to it; should otruding [illegible] the cavity of the scrotum, the hernia tal, though [illegible] variety of inguinal; femoral hernia is that morbid state in which the protruding mass finds a way of escape beside the femoral vessels; and, for similar reasons we have obturator, ischiatic, labial, and several other varieties. A hernia occurring at birth is called congenital; and if the vaginal process of the peritoneum which is prolonged into the scrotum by the "descent" of the testicle, be left open, so that a loop of intestine follows the course of the spermatic cord and rests in contact with the testicle or somewhere on the way to that organ, the protrusion is often called Hey's hernia. There are several forms of this, but not important enough to require minute description. They are mostly congenital. A retained or late descending testicle is usually attended with some form or condition of hernia.

The hernial *sac* is a pouch or process of peritoneum, which the pressure of the protruding viscus has stretched and prolonged, that reaches as far as the tumor extends, and forms the external envelop of the herniated mass. It is, when fully developed, in the shape of a flask, or old-fashioned glass bottle—the neck being small because the canal in the abdominal walls is unyielding, but the fundus assumes a spherical shape as soon as it meets with little opposition to expansion. At first the sac is in the shape of a digital depression, then it becomes funnel-shaped, afterwards that of the finger of a glove, and finally the form of a pear. The inside of the sac having a moist and smooth surface, will not permit the enclosed viscera to become adhered to it, but the outside being fibrous may get attached to the structures in contact with it, and will not, therefore, go back into the abdomen when the hernia is "reduced." In some instances it never unites with the adjacent tissues, but is free to return to the cavity of the abdomen, when the protruding viscera are returned, or the hernia is reduced. In case the process of peritoneum which descends in front of the testicle remains open, and becomes filled with herniated viscera, the pouch may be called a *congenital* hernial sac; in other instances, the sac is *acquired*, or produced by gradual yielding and stretching of a restricted portion of the parietal peritoneum.

Hernia is said to be *reducible* when the protruding viscera can be returned to the cavity from which they have escaped; and *irreducible* when adhesions have taken place between the protruding mass and the structures adjacent. In young subjects and in recent ruptures, hernia can generally be reduced with gentle manipulation;—in fact, the herniated mass usually goes back itself when the recumbent posture is taken. Irreducible hernia is commonly confined to old subjects; and it is not safe to attempt to break up the adhesions which confine the protruding viscera in their abnormal situation.

As has been just stated, the reduction of hernia is to be accomplished by gentle manipulation, the patient being able, in most instances, to return the protruding mass to the cavity where it belongs. However, cases are not rare in which professional skill is required to effect reduction. Ordinarily, when surgical aid is needed, the patient should lie upon a lounge, with the lower extremities moderately flexed, while the operator presses the tumor in a direction the reverse of what the hernia took in making its escape. To complete the reduction the finger should invaginate the loose integument, and follow the receding mass clear through the canal involved in the displacement. It is an easy matter to invaginate a process of the scrotum, and crowd it before the finger until the internal inguinal ring can be felt; yet it is not possible to invaginate the integument of the thigh so as to carry the finger into the femoral canal.

In the diagnosis of hernia, it is to be borne in mind that hydrocele resembles scrotal hernia in outward appearance, the differential distinction being made out by the history of the difficulty, and by examinations and explanations. A hydrocele begins to distend the scrotum from the bottom, while a hernia enters from the top and gradually descends. Usually a dropsical effusion into the tunica vaginalis produces a scrotal tumor which is more or less translucent—the test being made in a dark room by holding a light on the side opposite to the eye. A hernial tumor is opaque. Hydrocele usually produces no fullness in the inguinal region, and the tumor can not be pushed upwards successfully; a hernial tumor is reducible, or has been at some period of its history. Hydrocele feels elastic when squeezed, but herniated viscera impress the fingers with a doughy sensation. In doubtful cases an exploring needle may be used to establish a correct diagnosis.

The fullness produced by enlarged veins in the spermatic cord on the left side, is liable to be mistaken for hernia by the inexperienced, therefore a little care should be exercised to avoid an error of diagnosis. Varicocele imparts a pasty and flabby impression to the fingers manipulating it, and a feeling to the examiner as if a mass of earth-worms were twisted about the spermatic cord and the top of the testicle. Varicocele prevails mostly in young men; and their left testis, when the veins of the cord are varicose, is small and soft. A scrotal hernia on the left side makes a larger and firmer tumor than a varicocele, and dilated veins cannot be felt in connection with it. Besides, hernia can generally be reduced, and varicose veins fill again in a minute even if they be emptied by manipulating the parts upward.

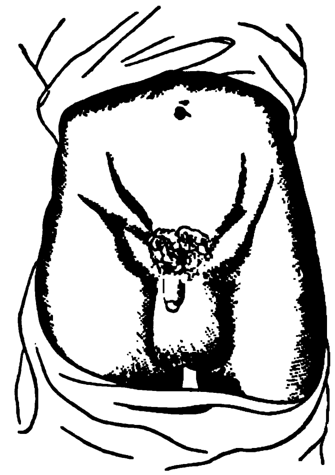
The most perplexing cases to diagnose are where an adipose or fibrous tumor occupies an inguinal or femoral canal, and the patient complains of dragging and other sensations that might easily be taken for those often belonging to hernia. In two or three instances I have been so uncertain in regard to the diagnosis that I have asked for repeated opportunities to examine the equivocal swellings; and in all these cases it finally turned out that hernia did not exist.

Acute swelling and chronic enlargement of lymphatic glands have been taken for hernial tumors, though the location of such enlargements could rarely create doubt in regard to their nature; and time would be likely to rectify mistakes. Nascent abscesses and buboes have been, through faulty diagnosis, subjected to the pressure of a truss, but no permanent harm would result from the blunder, if it was timely discovered. Scrotal hernia and hydrocele have existed not unfrequently in the same patient, therefore when this complication is suspected, the dropsical effusion should not be withdrawn until the hernia was reduced; and no irritating substance should be injected into the tunica vaginalis with the object of producing a radical cure, lest the hernial sac be inflamed thereby.

Several varieties of hernia may exist in the same individual. I have examined a patient having inguinal hernia on both sides, and a femoral hernia on the right side; and there is no special reason why an umbilical, obturator, or ischiatic hernia might not have been present in the same individual. I have repeatedly met with persons having a femoral hernia on one side and an inguinal on the other.

The inguinal canal is a loose space on each side of the hypogastrium through which the spermatic cord in the male and the round ligament in the female, is lodged or rests; and it reaches from the transversalis fascia, in which is the *internal abdominal ring*, to the triangular opening in the tendon of the external oblique muscle of the abdomen, which is called the *external abdominal ring*. The canal is a loose space in order to allow the veins of the spermatic cord and the round ligament to empty themselves without obstruction; and being patulous the space offers a favorable opportunity for the viscera of the abdomen to find their way along the canal, or to become herniated. The passage-way is about an inch and a half in length, and runs obliquely from the peritoneal lining of the abdomen, first through the transversalis fascia, *then* beneath the lower borders of the transversalis and internal oblique muscles, and, *lastly*, terminates between the pillars of the external oblique tendon, which stand apart to form the external abdominal ring or opening. The internal extremity of the spermatic canal is deep, and three-quarters of an inch above Poupart's ligament; and the external extremity is little more than subcutaneous and nearer the median line of the body than the beginning of the canal. The obliqity of the canal is an obstacle to the descent of viscera, the layers of the abdominal walls acting as a valve to close the passage-way.

FIG. 161.

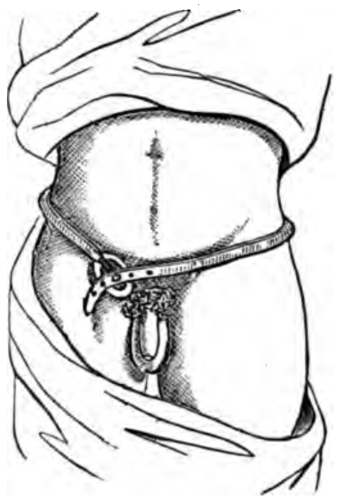


Double hernia: inguinal on one side, and femoral on the other.

The spermatic cord when it passes through the internal abdominal ring is comparatively small, consisting chiefly of the spermatic vessels, some nerves, and the vas deferens; but while passing under the edge of the internal oblique muscle, it receives a muscular investment which is called the cremaster muscle. This augments its size considerably; and its mass is still further increased by fascias obtained in its course to the scrotum.

Oblique inguinal hernia is very common in the male; and the visceral protrusion occurs oftener on the right than on the left side, the proportion in twelve cases being as seven on the right to five on the left. Females may have inguinal hernia, though the diminished size of the inguinal canal acts as a barrier to the accident; and they have a proportionately larger femoral opening than males, therefore they are more liable to femoral hernia than the opposite sex. *Direct* inguinal hernia is that form of the disease in which the protruding mass does not go through the internal abdominal ring and the greater part of the spermatic canal, but comes straight through the abdominal parieties at a point opposite the external abdominal ring, carrying the conjoined tendon of the internal oblique and transversalis muscles before it, or lacerating the tendon sufficiently to pass through it. The direct form of inguinal hernia is not so rare as some writers have intimated; and when once established it is not easily kept in a state of reduction with a truss, on account of the abdominal opening being close to the spine of the pubis, the prominence of bone obviating the pressure of a truss-pad directly upon the aperture.

FIG. 162.



Ordinary truss for inguinal hernia.

The usual treatment for inguinal hernia is to return the protruding mass to the cavity of the abdomen by digital efforts, and retaining it there with a compress and bandage. A vast amount of ingenuity has been expended in combining the compress and bandage so that the mechanical contrivance shall be efficient and easily worn. The combination is called a truss, and consists of a pad or block, held in place with a strap or spring.

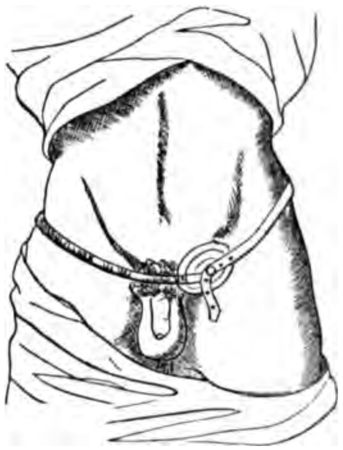
The requisite and essential qualities of a truss are lightness, firmness, and elasticity; but these features cannot always be combined in trusses made for special purposes, or particular cases. A truss invented by Dr. Looney, embraces many qualities that are admirable. It consists of a wooden block, two coiled springs, and a strap. The pad and strap are not essentially different from corresponding parts in other trusses, but the pressure imparted by the two springs is easily borne and quite efficient. As a retaining instrument it has no equal.

The Stagner truss is simple, efficient as a retaining instrument, and may produce a radical cure. It consists of a wooden block, a steel spring shaped somewhat like a rib, and a leather strap which covers the spring, and, after surrounding the body, hitches to a hook on the block. The pressure of the spring is designed to be great enough to keep a hernia in a state of reduction, although it will not do so in all instances. Modifications of this instrument, in forms both ordinary and elegant, are to be obtained in the drug-stores of every city and large town. Manufacturers sell a fair article for twelve dollars a dozen; and retailers charge from three to five dollars apiece. A better class of goods commands higher prices.

The compress or pad of a truss should be made of cherry or cedar, and shaped much like half a hen's egg, divided through its long diameter. It may be made of glass, ivory, horn, or vulcanized rubber; and neither of these substances gets soaked with perspiration. A leaden cover has been used upon a groundwork of wood, but nothing valuable is gained by the combination. A complicated instrument, having a small ivory ball in the center of a ring, is much in use, its inventors claiming that it is especially efficient in producing radical cures; yet the complication is more efficient in making the purchaser pay an exorbitant price than in curing hernia. A plainer truss, having a good spring, and a wooden pad, will produce a radical cure in curable cases; and no instrument yet invented will cure many cases of hernia in persons over fifty years of age. The young are readily cured with almost any kind of a truss.

Individuals having no experience in the wearing of trusses look upon a hard pad as an instrument of torture; and consequently are easily persuaded to try an upholstered affair, as if a cushion of flax or hair, covered with buckskin, would be much more comfortable to endure than a pad of wood. But it is found that an upholstered compress soon becomes hard through usage, and foul from the soaking of perspiration. An infant wears a wooden padded truss with ease, and it keeps an upholstered compress constantly wet.

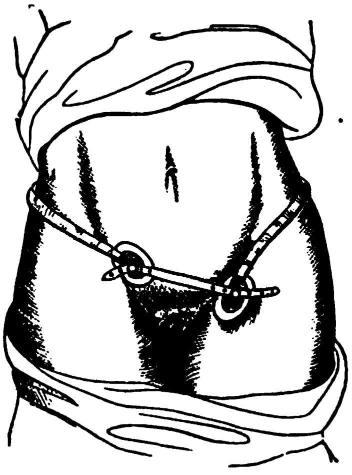
FIG. 163.



Truss-spring reaches across front of abdomen, to give length to it, and consequent ease to pressure.

The metallic spring of an ordinary truss extends around the of the side the hernia exists, consequently the elasticity is trained to a short range, and therefore, in some instances, must grievous to bear. It is generally better to have the spring tend from the pad to the opposite hip, the median line of the dy being crossed in front. This gives length to that part of spring which exerts force upon the pad, and, as a sequence, ater elasticity. It is found, too, that a spring thus constructed ll hold the pad in place better than the shorter spring which sses round the hip on the same side the hernia exists. Steel ings corrode rapidly, and soon break, therefore it would be sirable if the hoop of a truss could be made more durable. Elastic webbing is used considerably to hold a truss-pad in ace, and exert pressure; but the elasticity of the belt is too on lost, and the fabric becomes sodden and offensive.

Fig. 164.



Double truss; one pad for inguinal, and the other for femoral hernia.

A truss is rendered more endu- ble by having the end of the ring, which passes round the p posteriorly connected with a ldle that rests easily upon the k. The spring should not be nly joined to either the pad or saddle, but allowed some play conform readily to changes posture in the body of the arer.

It is often necessary to have a ap reach from the saddle or ing behind the hip, down be- een the limbs, and up to the d in front, to keep the truss m slipping upwards. This is disagreeable appendage, but n not be dispensed with in some stances. A double truss generally requires two perineal ap- ndages to keep it in place.

A truss for femoral hernia is constructed much like one made the retention of inguinal hernia; but, as the pad rests lower, spring should be so twisted that the compress shall bear upon per place. If the same spring be used as in a truss for hernia, the pad should turn downwards, and be so connected with the spring that it shall exert pressure at a point lower than it would when intended to cover the inguinal canal.

Umbilical hernia requires a truss which is made specially for that kind of accident. The pad is large, and has a knob raised in its center to drop into the umbilical opening. The spring is a semicircular hoop, and a strap attached to its covering completes the surrounding of the body. Small instruments are constructed for infants, and very large ones for persons with protuberant abdomens.

It is impossible to retain an obturator or ischiatic hernia with any kind of a truss; and ventral hernias at a distance from the inguinal regions, must have trusses made specially for them.

In oblique inguinal hernia the truss-pad should rest directly upon the inguinal canal, both rings being overlapped; and in direct inguinal hernia the pad must be made to rest upon the external abdominal ring, for the protrusion, as stated before, is not through the internal ring. Before a truss is applied in the treatment of inguinal hernia in the male, the fore-finger is to be placed on the side of the scrotum, and a fold of loose integument carried upward and along the course of the spermatic cord, as far as practicable, to ascertain, if possible, whether the hernia be oblique or direct. In most instances the differential diagnosis can thus be distinctly determined. If the hernia be of the direct variety, is is difficult to keep the pad in place, on account of the spine of the pubis, which pushes the pad upwards when the body is brought into a stooping posture.

A truss should retain a hernia completely and unremittingly, or it may provoke irritation and inflammation of the protruding mass and lead to strangulation. Many persons lay aside a truss after they get into bed, and replace it again before they get up in the morning. This will do, especially if a radical cure is impracticable. Some individuals wear a truss outside the shirt, but in most cases the instrument will not stay in place and retain the hernia unless the pad rests in contact with the integument. As soon as a truss-spring becomes brittle from accumulations of rust, or too weak to accomplish its object, a new instrument should be obtained. Life has been placed in jeopardy by neglect, or misdirected economy, in not obtaining a new truss soon enough.

The instinctive modesty of a woman often leads her to conceal the fact that she is suffering from hernia, instances not being few in which her medical adviser has not been informed of the disease until strangulation existed. A woman afflicted with hernia may get along pretty well without wearing a truss, yet her life is constantly in peril from strangulation. Men frequently entertain the foolish notion that hernia is in some way connected with the genital organs, or is the result of sexual irregularities, and will put themselves under the treatment of advertising venerealists, or resort to a truss vender, instead of making their infirmities known at once to their family physicians; and quite often they get outrageously swindled as a penalty for their ignornance.

Umbilical hernia is quite common in infancy as a result of crying, coughing, sneezing, and straining, before the walls of the abdomen have properly contracted around the remains of the umbilical cord. The difficulty is often treated by applying a button or bullet to the yielding spot, and keeping it there with a bandage or belt around the body. It is better, however, to apply a properly fashioned truss, and not experiment with cheaper substitutes. Women who have borne children, and have accumulated much adipose tissue after the age of fifty, are quite liable to umbilical hernia. Men rarely are afflicted with umbilical hernia, though burdened with corpulency. A properly adjusted truss cures umbilical hernia in a child, but is only useful as a retaining instrument in the adult.

Much ingenuity has been displayed in attempts to radically cure hernia by operative measures, yet no method has come into general use. Every plan thus far devised is attended with danger, and the necessity of confinement for days or weeks; besides, relapses, or the return of the complaint, have been too frequent to be encouraging or assuring. In hospitals and eleemosynary institutions flattering operative procedures may be executed, but in private practice few patients are to be found who are willing to encounter the risk and undergo the suffering attendant upon a surgical operation instituted for the cure of hernia.

The fact that strangulated hernia, which is liberated by operative means, often results in a radical cure, has led the inventive to try different plans for provoking inflammatory action in the inguinal canal, hoping to close the passage taken by the protruding mass, or so far obstruct it that the viscera can not descend. [illegible] method is to employ a hypodermic syringe, and inject the [illegible] of iodine into the inguinal canal, pressure being made over the internal abdominal ring to prevent the fluid from entering the peritoneal cavity. Some good results have attended the operation, but a subsequent return of the hernia may be expected in most instances. Nearly all other plans necessitate invagination of the scrotum, the involution being maintained by a suture, or plug of some kind, until the invaginated mass becomes blended with the walls of the inguinal canal. Wutzer used a cylinder of wood which was perforated from end to end for the passage of a needle, whose point and handle could be removed, to allow a clamp to be screwed down so firmly that the invaginated tissues would be compressed, the idea being to provoke inflammatory action and a blending of the organic structures. After the welding was presumed to be sufficient, the clamp was unscrewed and the cylinder removed. The operation is attended with some risk, and the hernia returns in a large per cent. of cases operated upon.

The radical cure of hernia may be affected by the use of two bullets and a silver wire to hold them in place. The bullets are to be perforated with two holes, and a long needle is to be employed in passing the wire from the bottom of the invaginated scrotum to the outside of the integument over the internal abdominal ring. One end of a piece of wire a foot long is carried first; then the other, after it is carried through one hole in the bullet and returned through the second, is passed like the first at a distance of half an inch from it. The two ends are now drawn upon until the bullet is pulled to the bottom of the invaginated scrotum, and it is held thus by slipping another doubly perforated bullet upon the two ends of wire, and binding it snugly to the abdomen. The loop of wire holds the invaginated bullet, and twists of the two ends retain the other. Neither the leaden bullets nor the silver wire create much irritation, therefore there is no objection to wearing the apparatus for years. The inguinal canal is thus occluded beyond the possibility of hernial protrusions. I have put this plan in practice in only one instance; and the patient has worn the bullets four years without inconvenience. The link of silver wire is about an inch in length, and produces no irritation. The twisted ends are so bent that their extremities rest against the bullet, and do not therefore irritate the skin nor catch in the clothing.

Irreducible hernia, as has been suggested, is that condition of the protruded mass that prevents a return of the viscera to the abdominal cavity. A hernia may become irreducible on account of its size. The protrusion, when not reduced and retained by a truss, usually grows larger as age advances, until the abdomen contracts as the viscera escape, consequently there is no longer room for their return. The protruded mass may become blended with the walls of the canal, or so altered in shape from the development of fat or the growth of tumors, that it will not return. Adhesions between the inside of the sac and its contents, and between the outside of the sac and the inside of the canal, are the common impediments to the reduction of hernia. A truss should not be applied to irreducible hernia, but when the herniated mass is very large it may be supported with a suspensory apparatus. I have seen hernial tumors that reached to the knees, and so capacious that most of the intestinal track must have been outside the abdominal cavity. An irreducible hernia may become strangulated; and if the constriction is overcome by operative measures, no attempt should be made to break up the adhesions that reduction be accomplished, lest the intestines be cut or torn. The strangulation is to be overcome, but the hernia is to be left in its irreducible state.

STRANGULATED HERNIA.

A hernia is strangulated when the protruding mass at some point is subjected to a degree of constriction which arrests the circulation through the vessels of the incarcerated viscera, and impedes the passage of gases, fluids, and fæcal matter in the involved intestine, and also prevents a return of the protruding structures to the cavity of the abdomen. The constricting medium is usually located at the narrowest part of the canal through which the hernia has passed, and may consist of a fillet of fascia, or the sharp edge of the abdominal aperture. Inguinal hernia is oftenest strangulated at the internal abdominal ring, yet the external ring may furnish the medium. I have known a process of omentum to strangulate a knuckle of intestine that descended with it. Inasmuch as the contents of the intestinal canal have to descend one branch of a loop of protruded bowel, and return through the other before they can pass along to the anal outlet of the body, it is not strange that flatus and fæcal matter should occasionally get obstructed at the gateways of a narrow canal. The obstacle has only to arrest the course of the fæcal matter, to cause distension in the protruded knuckle of intestine,—the distension provokes irritation, and impedes the flow of venous blood to the extent of inducing engorgement, and the impediment leads to the development of gases in the incarcerated intestine, so that one obstacle begets or aggravates another, until the protruded knuckle of intestine is in a condition similar to what it would be if a ligature were thrown around the mass. Inflammatory action is set up by the constricting agency, and the products contribute to the difficulty by gluing parts together that were mobile, and forming barriers to a liberation of the incarcerated structures. The increased bulk of the protrusion also prevents its retrograde passage through the small aperture by which it escaped from the abdomen. The sharp edge of Gimbernat's ligament, which is usually the strangulating medium (in femoral hernia), and the thin margin of the aperture—internal ring—in the transversalis fascia (in inguinal hernia), are bad barriers for a tube as yielding and impressible as that of intestine to be pressed against and doubled across. And it does not take long at those points, as soon as a condition of strangulation sets in, for the neck of the sac and what it embraces, to become too thoroughly blended to be easily and readily disengaged. Even after the constriction is overcome, and the knuckle of intestine is returned to the cavity of the abdomen, it may take some time for the vermicular movements of the intestinal track to separate the adhered tissues. In some cases the uniting medium is too tenacious to be overcome.

The symptoms of strangulated hernia are generally pronounced and unmistakable. After a hearty meal, during violent exercise, or while diarrhœa exists, the patient experiences a tightness or fullness in the abdomen, as if something was not working freely there, and soon the uneasiness leads to an attempt to force a passage at stool. The effort may be attended with a moderate dejection, but the uneasy sensation is not relieved. A disposition to eructate gas from the stomach leads to successful efforts at belching, yet no substantial relief follows. A feeling as if a tight cord was drawn around the body in the vicinity of the umbilicus increases, and the patient begins to express anxiety in appearance and action. Chilliness, succeeded by flashes of heat, is usually a symptom; and a persistent perspiration covers the body. Repeated attempts to have a passage from the bowels are unsuccessful, but the belching is changed to vomiting. There may be considerable pain in the hernial protrusion, but this is not an invariable symptom. However, the hernial tumor is found to be as hard as a stone, in most instances, and manipulation of it causes pain. The pulse gets quick and small, dryness of the fauces comes on, and a disposition to change attitudes. The jactitation is often marked, especially while the disease is in an active state of progression. During the later phases, when the patient is moribund, a quiet state may be reached.

Uncontrollable retching and vomiting are prominent indications of strangulated hernia, especially if stercoraceous matter be thrown up. Great prostration of the bodily powers and mental anxiety are features rarely absent. Swelling of the abdomen, and rumbling of intestinal gases, indicate intestinal obstruction of some kind. After strangulation has existed some hours, the hernial tumor loses some of its resiliency, and becomes doughy to the touch, as if the vital activity of the parts was subsiding; but this is an indication that the constricted tissues are becoming gangrenous, and is therefore dangerous. Mortification usually takes place just at the sulcated line—where the constriction exists—and the parts below soon become sphacelated. This is practically the end of the difficulty, unless the adjacent tissues soften under inflammatory action, suppurate, and establish a fæcal outlet for the contents of the gangrenous and perforated bowel—an artificial anus being the result.

When the strangulation is not complete, a patient may live eight or ten days after unpleasant symptoms come on; yet, in the majority of instances, the constriction wholly arrests the circulation in the incarcerated knuckle of bowel, and entirely obstructs the passage of flatus and fluids at the seat of strangulation, and a fatal issue is reached in three or four days from the onset of the disease. In most cases peritonitis is a prominent feature in the morbid action, and may be the immediate cause of death. Even after strangulation is overcome, the peritoneum, which has become inflamed at the constricted point, may take on general inflammation, that terminates in the usual way. Peritonitis is to be feared in all cases of prolonged strangulation; and especially if the hernial tumor has been violently manipulated in fruitless efforts at reduction by taxis.

In rare instances, an inguinal hernia that has passed the internal ring, but never reached the external, may become strangulated without exhibiting any outward swelling or tumor; or a hernia may be partly reduced, and then become strangulated at a point out of sight and reach. These conditions render the diagnosis obscure, general features, instead of local signs, determining the morbid state. A small hernia is more likely to be strangulated than a large one; therefore it is judicious to make a thorough examination of all the regions where a hernial protrusion may exist, if the symptoms of strangulation are present.

Mistakes have been made by the most experienced surgeons, therefore those who have had a limited acquaintance with hernia should be exceedingly careful in their inquiries and explorations. If an individual suffering from intestinal obstruction has had a hernia, the region affected can not be too carefully scrutinized. Even an incision may be made in the suspected region, and a finger employed in the wound to deepen it, and to make sure that the inguinal or femoral canal contains no hernia.

I was once called to see a man who had been afflicted with inguinal hernia for many years; and within a few days of my visit he had been treated for intestinal obstruction of some kind, and was considerably prostrated, with the symptoms of strangulated hernia. The difficulty came on while taking a bath, and the hernia was *apparently* in a state of reduction. I proposed to make an exploratory incision in the inguinal region, for the purpose of ascertaining if the internal ring was clear. The physicians in attendance objected on the ground that they had thoroughly explored the inguinal canal its entire length, when the abdominal tumefaction would admit of invaginating the scrotum, and pressing the finger as deep as the internal ring. My proposition was not accepted, and in a few days the patient died. An autopsy revealed strangulation of a knuckle of intestine protruding through the internal ring, but not reaching to the external abdominal opening. If my plan had been followed, the protrusion would have been discovered, and the strangulation relieved. In the event of intestinal obstruction, with the general symptoms of strangulated hernia, it would be justifiable to open the abdomen, and there seek the nature and location of the obstruction. Although the exploration may be fraught with some peril, the obstruction, if unrelieved, will certainly prove fatal. The exploratory operation should not be postponed until dangerous peritonitis is reached. An obscure variety of hernia, as a diaphragmatic or ischiatic hernial protrusion always is, might thus be discovered and relieved. Since ovariotomy has proved to be legitimate, surgeons have not been prejudiced against gastrotomy when symptoms warranted the operation.

TREATMENT OF STRANGULATED HERNIA.

Strangulated hernia constitutes an emergency too pressing for anything like a Fabian policy, therefore it is the duty of the medical attendant to overcome the obstruction at the earliest moment practicable. The fact that some individuals unrelieved may survive ten or twelve days, and then successfully undergo an operation, exercises no influence over the discreet surgeon. The sooner a strangulated hernia is reduced the better; and the earlier the attempt at reduction, the easier the effort and the more satisfactory the result. No advantage need be expected from delay; and it is reprehensible in a criminal degree to fritter away valuable time in the execution of absurd manœuvres and the employment of ridiculous means, to relieve the constriction. Many of the old schemes which have been advocated as rational and legitimate methods for overcoming strangulation, seem to have been suggested as the expedients of the timid, to consume time or to keep up the appearance of doing all that can be done. The inexperienced practitioner, quailing under the weight of impending responsibility, readily embraces, without discrimination, the silly devices of the incompetent, being too much frustrated to consider whether the means advised are adequate for the occasion.

In the treatment of strangulated hernia there are but two courses to pursue: if the one fail, the other is to be tried as soon as practicable. Well executed taxis while the patient is under profound anæsthesia, constitutes the first course. And if it be put in practice early, success will generally result. In the event of failure, a cutting operation is the only resource left. Unfortunately the operative proceeding is too often delayed till death becomes imminent whether the stricture be divided or not. An operation postponed till the patient is moribund, brings undeserved discredit upon a most desirable method of relief when timely applied, and often the only hope of escape from a fatal issue. The patient instinctively shrinks from the employment of the knife, and the timid medical attendant, only too glad to shun the use of an instrument which unskillfully handled may do irreparable mischief, readily yields to the inclinations of his patron.

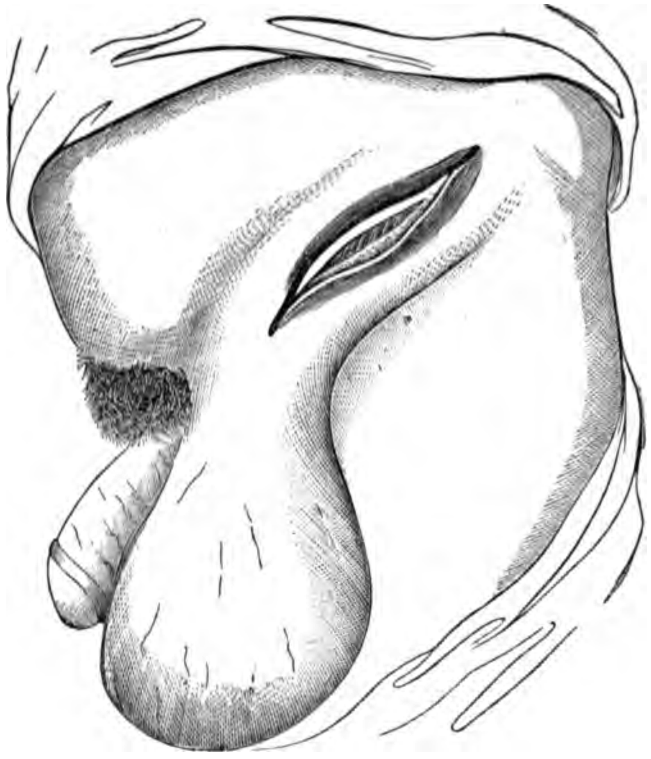
Strangulated hernia is not a common accident, neither so rare as to make it safe for the obscure practitioner of medicine and surgery to neglect the study and proper understanding of the subject. And the more isolated the physician from the assistance of his professional brethren the better should he be prepared for emergencies. It is then that no part of the responsibility can be divided or shunned. The life of a fellow being is in the greatest peril, and nothing but a surgical act can avert the danger. The unpretending practitioner of medicine and surgery is not to be appalled by the nature of the case, for the old operation has been robbed of its terrors by the introductiou of a simple method of procedure.

When called to a recently strangulated hernia, the physician should administer chloroform to the patient at once, and as soon as the condition of profound anæsthesia is reached, an attempt should be made to overcome the strangulation by taxis. The lump to be returned to the cavity of the abdomen being large in proportion to the size of the aperture at the line of constriction, it is obvious that the operator must display some tact in his manipulations. The parts of the protrusion which escaped last, or those in proximity with the constricting medium, are the first to be returned. To illustrate: when a boy I was sent to mill with a bag of corn thrown into the bottom of a wagon which had a knot hole in it. Upon arriving at the mill I attempted in vain to lift the grist from its position, for a portion of the sac containing about a quart of grain had jostled through the hole in the wagon-bed, and its bulk was too great to return *en masse.* Crawling under the vehicle I recognized the situation of affairs, and proceeded to return the protruding pouch. Pushing against the lump as a whole effected nothing; but it did not take long to return the corn kernel by kernel till all was back in the main bag above. In a somewhat similar manner a hernial protrusion is to be reduced by manipulation.

It is never to be forgotten that a hernial tumor which has been strangulated for hours or even days, must be handled with a proper regard for its vulnerable condition. Not unfrequently, there is reason to believe, a strangulated hernia is kneaded so roughly that the constringed tissues are severely contused or irreparably damaged. The coats of the intestine in a healthy state will endure considerable compression and distension, yet the disorganizing effect of strangulation soon incapacitates the bowel for withstanding rough usage. I will, therefore, add in this place, that I never hesitate to employ great force with my fingers in attempting to reduce a hernia recently strangulated; and that I am correspondingly cautious in manipulative efforts to return a hernia which has been in a state of strangulation for several days. It may not be ill-timed to remark in this connection, though the idea is repeated in another place, that violent manipulation in the event of failure to reduce the hernia, should be followed as soon as practicable by herniotomy, for it has been observed that a roughly handled hernia rapidly exhibits the signs of violent usage. More damage may be inflicted in a few minutes by irrational or impetuous brute force than the natural means of constriction could produce in several hours, or even days. The fatal condition of gangrene and sphacelus is too commonly hastened or provoked by violent, protracted, and ill-directed manipulation. It has been observed that the worst symptoms of strangulated hernia are slowest to appear in those cases which have not been actively treated. The employment of undue violence in senseless attempts to reduce strangulated hernia is presumed to be common. A patient incurs extravagant risks by falling into the hands of a physician who, conscious of his inability to use the knife skillfully, endeavors to make amends by prescribing heroically, and manipulating vigorously.

Taxis, or dexterous manipulation, while the patient is under chloroform, having failed, the surgeon is to proceed at once to relieve the strangulation by the assistance of the knife. Although a cutting operation for the relief of strangulated hernia has been regarded as one of the most delicate, dangerous, and important in surgery, I propose to offer an operative procedure which can be safely and successfully followed by the merest tyro in surgical practice. My plan is, in a case of inguinal hernia, to make a cut in the skin an inch long, over the course of the inguinal canal, the incision reaching upon the edge of the tumor. The finger or end of the grooved director clears away the superficial fascia, and exposes the glistening tendon of the external oblique muscle. The aponeurosis of the muscle being too strong to be torn with the finger, a slight fold of this structure is to be raised with forceps and nicked with the knife; the grooved director being then used to isolate the tendon from the tissues beneath, the knife divides the aponeurosis to the extent of the incision in the integument. The knife is now to be laid aside, and the operation completed with the finger. The external ring often constitutes the stricture; yet, wherever existing, the finger is to find it, and, by a tearing force, to overcome it. By this method there is no danger of cutting the intestine, or of doing other mischief with the knife. If the seat of strangulation be at the internal inguinal ring, the finger, carried through the slit in the skin and the external oblique apenourosis, finds no obstacles to its ready passage along the course of the spermatic cord and intestine, which to some extent are guides to the seat of stricture. The strength of the finger is competent to lacerate the few constricting fibres which constitute the strangulating medium. The old method of pushing the point or edge of a knife, though guarded by the finger or shielded by the director, to the line of constriction, was not without peril to bloodvessels and intestinal walls,

FIG. 165.



Operation for the liberation of strangulated inguinal hernia.

therefore the suggestion of a course which avoids such risks, must commend itself to those at least who have regarded the usual operation as fraught with the greatest hazard. The finger is strong enough to insinuate its nail and extreme end beneath the constricting band, and then to force asunder the strangulating medium. The constriction once overcome, there is usually no remaining obstacle to a ready reduction of the hernial tumor. In rare cases the hernia is irreducible, from adhesions of the sac to surrounding structures, and must therefore be left in its old site after the strangulation is overcome. And in an occasional instance a large hernial protrusion has existed so long that the contracted abdomen will no longer receive its original contents, consequently more or less of the intestinal folds must be allowed to remain where they are after the stricture is loosened.

On the Propriety of opening the Hernial Sac.—It will be perceived that I advise as a rule that the hernia be reduced without opening the sac for the purpose of examining the bowel. Those surgeons who favor incising the peritoneal sac and inspecting its contents, claim that when the necessity arises for a cutting operation to relieve strangulated hernia, the fact alone is sufficient to require a thorough examination of the contents of the hernial tumor, to see whether the knuckle of intestine be gangrenous or not, and to liberate vicarious adhesions between the protruded viscus and the inside walls of the sac; or to disentangle folds of bowel and omentum.

Did it ever occur to the advocates for opening the hernial sac, that they attempt reduction by taxis one minute, thinking or saying nothing in regard to the dangers of returning a strictured and gangrenous bowel; and, failing in the effort, the next minute a cutting operation is executed, with urgent necessities for opening the sac, lest a putrid, perforated, or unrelieved strangulated bowel go back into the ventral cavity? They do not seem to see the inconsistency of disregarding the condition of the bowel while one object is in view, and exercising so much solicitude in another aspect of the case. An incision of the hernial sac, allowing air and fluids to come in contact with the viscera of the abdomen, may be followed by dangerous shock and other mischief; and no little harm may arise from the handling of inflamed intestinal folds. Peritonitis, which is one of the leading dangers in strangulated hernia, is not imminent when the stricture is overcome without opening the sac. Adhesions between the serous coat of the intestine and the inner walls of the sac do not occur as often as is generally supposed. Mr. Colles says, "Adhesion between the gut and the sac is a *very* rare occurrence." If [illegible] of intestine be intimately joined by inflammatory action, they may be as safely returned in this condition to the cavity of the abdomen, as dealt with in any other manner. It would certainly be dangerous to cut or tear apart such adhesions. Mr. Birkett, in Holmes' System of Surgery, terminates some remarks upon the subject as follows: "In many of the metropolitan hospitals the operation external to the sac is performed in suitable cases, upon conviction of its advantages; and although we dare not venture to say that some of the fatal cases which have occurred after opening the sac might have terminated differently had it not been incised, we do not hesitate to affirm, that the untoward circumstances stated as likely to happen, when the sac is not opened, have not occurred." Surgeons who adopt neither plan, as a whole, have endeavored to establish the rule, that in those cases in which it would be deemed unsafe to return the hernia by taxis, if it were practicable, the sac should be opened; and in those cases where the surgeon would have no hesitancy in returning the hernia by manipulation, if such a feat could be accomplished, the sac should not be incised. The rule would have much to recommend it, if the condition of a hernia could be determined by external appearances or by other signs and circumstances, but in many instances the symptoms are deceptive. A very small tumor, with no outward marks of severe inflammation, may contain a knuckle of intestine in a state of gangrene; and a very large protrusion, of long standing, and with evidences of an advanced condition of strangulation, not unfrequently exhibits the contents of the sac in a nearly normal condition. Appearances, then, are not reliable; and risk has to be encountered by the operator. In a very unpromising case the strangulation might be relieved by overcoming the constriction "external to the hernial sac," and allowing the protrusion to remain for a day or two, or until it was determined whether an artificial anus was to form, or the viscus was probably fit to return to the ventral cavity without increasing the risk of a fatal issue. Meddling with the processes of nature is not desirable; and the surgeon should be a close observer of the natural tendencies, and endeavor to take advantage of indications. Although there could be no rational hope in the return of a lacerated and sphacelated bowel, still when the opening does not involve the entire calibre of the canal, it is probably best to place the herniated viscus within the abdomen, for sometimes the rent in the bowel will close, even after stercoraceous matter has freely flowed through the opening for several days. The abdominal cavity is obviously the best place in which an injured bowel may be repaired. Yet the opening made in the belly should be kept open several days to favor drainage.

STRANGULATED FEMORAL HERNIA.—Femoral hernia may become strangulated as well as the inguinal variety of the disease; and this kind of hernia being confined mostly to the female, who is ruptured less frequently than the other sex, the accident of strangulation is somewhat rare. The instinctive modesty of woman leads her to conceal the nature of diseases in proximity with the genital organs till the necessities of a case compel a disclosure. Not unfrequently a woman with strangulated hernia restricts her complaints to the region of "the stomach," and thereby misleads her medical attendant, until it is too late to relieve the difficulty. However, it is the duty of the physician, when symptoms resembling those manifest in strangulated hernia present themselves, to institute such inquiries and investigations as shall determine whether hernia exists or not.

Strangulated femoral hernia, like other varieties of the disease, is to be relieved by dexterous manipulation, if practicable; and by an operation, if well directed taxis fail. The mortality attendant upon strangulated crural hernia is very large; and especially great where the bowel becomes strangulated on the first descent, or in cases of recent rupture. Experience teaches that the incarcerated bowel should be liberated as soon as possible, and, if the taxis be not successful when the patient is fully under the influence of chloroform, the division of the stricture can not be delayed with as little peril as in strangulated inguinal hernia. Mortification has been known to take place within twenty-four hours after the first symptoms of strangulation manifested themselves. To handle a case roughly, and then, in the event of failure by the manipulative process, to postpone the operation for days or even hours, may seal the fate of the patient.

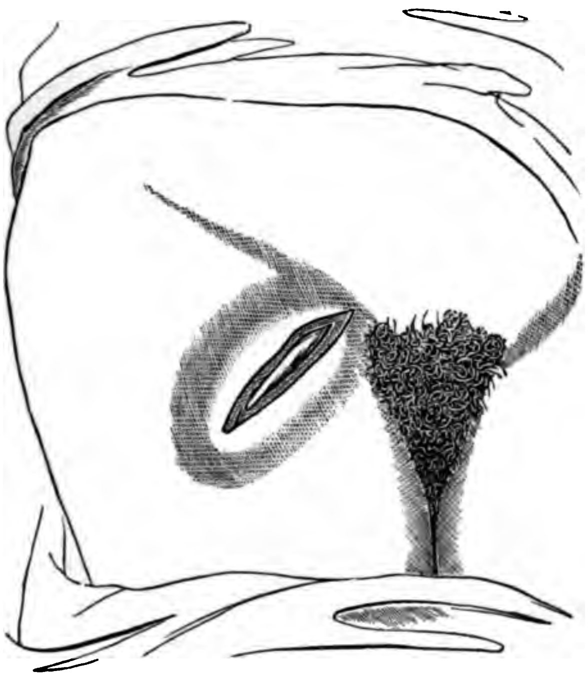
That the taxis may have every chance of success, the attitude of the patient and the position of the limb on the ruptured side, should receive particular attention. Every one familiar with the anatomy of the region, knows how much relaxation of tissues and structures can be secured by placing the trunk and limb in a state of easy flexion. Taxis would be certain to fail, if performed while the limb is in a rigid and extended attitude. The patient being brought thoroughly under the influence of anæsthesia, and the parts implicated in the strangulation being relaxed as much as possible by position, the tumor, which is generally small, should be pressed backwards, as if to bury it deeper in the thigh, and then upwards with an oscillatory movement. If this manœuvre, with such variations as may suggest themselves, does not accomplish reduction, there can be nothing gained by delay, therefore an operation is in order at once.

According to the old methods of operating to relieve strangulated femoral hernia, the dangers were too great and the rules too intricate, for an ordinary practitioner, bnt the plan I suggest can be executed by any one who can make an incision in the skin without fainting. The old precautions about wounding the obturator artery and other vessels of greater or less importance, were enough to frighten even a surgeon of great experience; for, was not the obturator sometimes out of its usual place, and were not accidents likely to occur to the most careful operators? By a more simple plan of operating the greater part of these dangers vanish.

OPERATION FOR THE LIBERATION OF STRANGULATED FEMORAL HERNIA.—Make an incision in the skin about an inch in length, reaching from the border of the tumor, inwards and upwards, to the spine of the pubic bone. The incision is made deliberately and with care, that nothing but skin be divided. The knife is then laid aside, and the forefinger completes the operation. The several fascias of the region can be easily torn with the finger, and the end of the digit can be carried readily to Gimbernat's ligament, which is usually the strangulating medium. The tumor, at its neck, will yield enough to allow the end of the finger to enter the circle of constriction; and then a moderate amount of strength will lacerate the tense fibres.

Having torn the constricting medium, the finger is in the right place to commence the reduction. Generally the tumor returns easily to the abdominal cavity, though cases may occur in which the finger will be required to disengage adhesions or free the tumor from fascial surroundings. No great force is needed to liberate the sac, which, with its contents undisturbed, is to be carefully pushed up through the crural canal into the ventral cavity. The same reasons for not opening the hernial sac are cogent, as already given in the management of strangulated inguinal hernia. The bowel does not generally adhere to the inner walls of the sac; and if it be gangrenous there is no better place for it than the cavity of the abdomen. No special after treatment is demanded. A wet compress may be kept upon the wound; and no cathartics are to be administered. The patient is to be nourished with liquid food, and otherwise cared for as in impending peritonitis. In a few days the bowels will be evacuated naturally, after which all danger is passed. The common practice of administering a cathartic as soon as the strangulation is overcome, is calculated to provoke or aggravate peritoneal inflammation. At the expiration of two or three days an alvine evacuation may be invited by the influence of a syringe, if the bowels exhibit obstinate constipation.

FIG. 166.



Operation for the liberation of strangulated femoral hernia.

The operation for the relief of obturator hernia in a state of strangulation, is not essentially different from that recommended for femoral hernia. The incision is the same, but the finger is to be carried deeper, in order to find the tumor. When the protruding mass is found, the finger is to seek the opening in the obturator membrane where the constriction exists. The end of the finger is then insinuated within the aperture sufficiently to [illegible] its edge to a slight extent. This liberates the circulation and the gases in the tumor to a degree that reduction may be readily accomplished. A truss can not be worn to advantage to keep the hernia reduced; but the operation is followed by inflammatory action which usually occludes the opening, especially if the patient keep in bed for ten or twelve days.

Umbilical hernia in a state of strangulation may be relieved by making an incision in the skin an inch or more in length, on a line corresponding with the linea alba, either above or below the umbilical opening, as the position of the tumor may dictate, the object in making the incision being to allow the fore-finger free access to the natural aperture in the abdominal walls for the passage of the umbilical cord. Although the opening is filled by the protruding mass, the finger can be so far insinuated as to enable it to tear the constricting medium to a moderate extent; and as soon as the band is torn the flatus in the tumor escapes, the swelling subsides, and reduction may be easily effected by gentle manipulation. The patient is to be in a state of anæsthesia, and care must be exercised while insinuating the finger between the hernial sac and the edge of the aperture, lest too much pressure lacerate the herniated intestine, which may be in a gangrenous condition, and easily lacerated. After the operation is performed, and reduction accomplished, a compress is to be worn over the opening for a few days, and then a truss is to take its place. The operative procedure may result in a radical cure of the hernia.

Hiccough is a dangerous symptom in connection with any variety of strangulated hernia; and if it continue after reduction is effected, it is probable that the patient will not recover. In fact, the outlook of an operation when the patient has reached the hiccoughing stage of the disease, is not flattering; yet it offers the only hope of relief, and should therefore be performed.

SECTION XVII.

DISEASES OF THE GENITO-URINARY ORGANS.

The testicle is enveloped in a double reflection of a serous membrane—the tunica vaginalis testis—which was originally peritoneum, and descended from the abdomen when the testicle left that cavity and became permanently located in the scrotum. Like other serous sacs, this one secretes a watery fluid; and the absorbents ordinarily maintain an equilibrium, so far as quantity is concerned—as much fluid being removed as there is secreted, a small quantity being always present for lubricating purposes. But, from causes not always known, yet generally from excess of secretion, a considerable accumulation of fluid takes place in the tunica vaginalis testis, producing a difficulty denominated *hydrocele.* The affection is quite common, and generally confined to the serous envelope of one testicle, though both may be involved at the same time. The disease, in its origin, can sometimes be traced to a blow, the effects of which are followed by secretory irritation. There is rarely present any appreciable inflammatory action during the progress of the accumulation; and the tumor is more objectionable on account of its size and weight, than from the morbid process attending its growth.

Children frequently have a form of the disease in which an inclosed space in the envelop of the spermatic cord admits an accumulation of serum, but the tunica vaginalis testis may exclude the fluid. This form of tumor has been called hydrocele of the cord; and it usually disappears in a few months without treatment.

In some cases the prolonged pouch of peritoneum which descends with the testicle does not close when the testis reaches the scrotum, but, remaining open, admits serum from the peritoneal cavity, and especially a loop of intestine, constituting congenital hernia. In still rarer instances a small canal remains open until adult life, and then, quite suddenly, the diminutive passage becomes dilated, allowing a hernial protrusion which differs from ordinary scrotal hernia by admitting the protruding viscera within the tunica vaginalis testis, instead of being in the scrotum outside of the testicle and its immediate envelops. However, this hernia, which is congenital in nature, is to be managed like ordinary inguinal hernia. Hydrocele of the cord may be punctured to evacuate the fluid, but the sac does not often require injections of irritating fluids to effect a cure. A hernial protrusion along the course of the cord in children is to be reduced, and treated with a truss. It would be a grand mistake for a surgeon, under the impression that he was treating hydrocele of the cord, to puncture a hernial protrusion which had dropped into an unclosed pouch along the course of the spermatic cord. The differential diagnosis is clear enough, for a hernia can be reduced, and hydrocele of the cord can not; and a pouch containing viscera imparts a different sensation to the fingers from that coming from a bag of water.

Ordinary hydrocele may be distinguished from scrotal hernia by the fact that a visceral protrusion comes from the inguinal canal, descending gradually, and the contents of the tumor may be carried back into the abdomen, the course of the spermatic cord being followed, while a hydrocele begins to show enlargement as far down as the lower extremity of the testicle, and in its growth develops upward, yet can not be pushed inside the abdomen. Besides, if a light, in a dark room, be held on the side of the tumor opposite the eye, a certain degree of translucency can be observed, that is absent while thus examining a hernial tumor. In the history of the development of hernia, the protruding mass returns into the abdomen at night, or while the patient is asleep; but a hydrocele continues at about the same size, whether the patient be asleep or awake. In cases of doubt as to the real nature of the tumefaction, an exploring needle may be safely used to test the contents of the tumor. If a hernia exist, the needle puncture is too small to be followed by serious harm; and in the event of a hydrocele existing, with an admixture of coloring matter mingled with the serum, its true character is revealed. Not unfrequently the debris of a small quantity of blood that has escaped into the tunica vaginalis, renders the tumor opaque, and imparts a coffee color to the fluid effusion. It is not uncommon for flakes of lymph, particles of fatty matter, and flocculent materials of various kinds, to be found floating in the fluid of hydroceles, especially when the disease is confined to elderly persons.

The position of the testicle in relation to the fluid accumulation, is in the posterior and inner part of the tumor, so that an exploring needle or trocar sent into the front aspect of the tumefaction is not liable to touch the testis; and the larger the tumor the more distant from the place of puncture is the testicle.

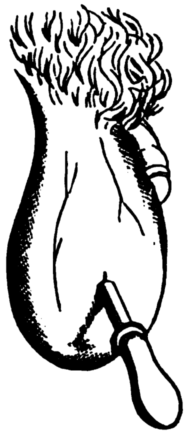
The quantity of fluid in a hydrocele is variable. Usually it is under a pint, but may amount to a gallon or more. Mr. Cline removed six quarts from a hydrocele of Gibbon, the well known historian. The shape of the tumor is commonly that of a pear, with the larger end downward. A transverse constriction near the upper extremity may lead to the suspicion that a hernia exists in connection with the hydrocele, or that there are two distinct sacs, but the organic form of the tunica determines the peculiarity of shape. When double hydrocele exists, the tumors are more likely to be cylindrical than pyriform, the swellings appearing like an enlargement of both testicles. In rare instances the tunic yields at some point more than at others, making a pouch-like dilatation, which may lead to the suspicion that sarcocele exists.

The testicle is rarely affected by hydrocele, and its location may be discovered by pressing upon the tumor, the organ being more sensitive than the distended sac. In children the testicle is found at the bottom of the tumor, and rests transversely in the scrotum. In old hydroceles the testicle is liable to be slightly atrophied. In some instances there is enlargement of the epididymis, thickening of the scrotum and walls of the tunic, and an increase in the size of the spermatic cord. An old gentleman came to me with hernia and hydrocele combined, and the tunica vaginalis and scrotum were greatly thickened. An exploring needle brought away a few drops of coffee-colored fluid that had no fæcal smell. I was satisfied that hernia existed, therefore I did not use a trocar, but made a careful incision for the purpose of evacuating the fluid. A finger carried into the cavity of the sac came in contact with a knuckle of intestine. An attempt was then made to return the protruding mass to the cavity of the abdomen, but the hernia proved to be irreducible from adhesions.

The patient was kept in the recumbent position for three weeks; and during that time the thickened tunic suppurated and closed, curing the hydrocele. The hernia was not unfavorably influenced by the procedure.

The treatment of hydrocele consists in evacuating the fluid with a trocar, and injecting the emptied sac with the tincture of iodine. The pain attending the operation is not severe, therefore anæsthesia is not required. The patient may sit in a chair, or recline on a lounge. As the entrance of a trocar meets with some resistance, a slight incision may be made with a sharp knife at the point selected for tapping. The incision is only to extend through the integument, and the trocar travels the remainder of the way with great ease. The point selected for tapping is on the anterior aspect of the tumor, a little below its central axis. The trocar is directed backward and somewhat upward, in order to leave the testicle untouched. The instrument is carried in with a moderate bounce, though not deep. As soon as the point reaches the cavity of the tunic the want of resistance to its progress indicates its situation. The trocar is then withdrawn and the canula left in place to draw off the fluid, which usually flows freely. Slight manipulation of the collapsed scrotum serves to thoroughly empty the sac. A syringe, the nozzle of which fits the opening in the canula, is charged with a drachm or two of the tincture of iodine, and by a plunge of the piston is made to inject the irritant inside the tunica vaginalis. As the nozzle of the syringe is withdrawn, the opening in the canula is closed with the finger, until manipulation of the scrotum forces the injected liquid into all the recesses of the sac. The finger is then withdrawn, and the fluid allowed to escape. The removal of the canula completes the simple operation, no piece of plaster being used to cover and close the wound.

FIG. 167.



Tapping hydrocele.

The object to be accomplished by injecting the sac is to excite adhesive inflammation over the interior of the tunic, which may be followed by obliteration of the cavity,—to destroy the serous nature of the sac so that there is no longer a secreting surface left. Many agents have been used to excite the proper grade of inflammation, as port-wine, vinegar, solution of zinc, etc., but nothing has proved so satisfactory as the ordinary tincture of iodine. A dilute form is not so desirable as the unreduced. It does no harm if a drachm or so of the medicine is left in the sac. The patient may walk about as soon as the operation is over, though exposure to cold and wet might be followed by too much inflammation and unnecessary pain. A reclining attitude in a comfortable room is generally desirable until the height of the irritation has passed, and the inflammation is subsiding. A low grade of inflammation is not desirable, inasmuch as it rarely results in obliterating the secretory action of the sac. I have known a mild stage of inflammatory action to be followed by a cure, yet such is not usually the result. In a few instances I have found the inflammation to take such a high grade that I have administered anodynes internally, and applied fomentations externally. It is rare for an exalted degree of inflammation to be followed by suppuration, unless the sac has been opened with a knife.

If the secretory character of the lining of the tunic be modified so that no serum is afterwards secreted, the cure is permanent; but if the change in the membrane fall short of obliterating its secretory function, a re-accumulation of the fluid may be expected. The failure will generally be known in five or six weeks, or even sooner; and when the re-accumulation is discovered, the operation may be repeated. I have operated for the cure of hydrocele many times, and estimate that one case in three fails at the first trial. Occasionally the second effort will fail, but I have not yet been obliged to try the fourth time. I once operated upon father and son the same day, and as nearly in the same manner as two operations can be performed. The cure was permanent in the son—a young man of twenty, but a second trial had to be made upon the father—a man of sixty.

In the event of failure with tincture of iodine injection, it has been recommended that a seton be used to provoke a sufficient degree of inflammation to establish a cure. A long needle may be used to carry a thread through the scrotum in two places and the cavity of the sac; or, a common probe with a piece of tape in its eye, can be passed through the canula and against the inside walls of the serous cavity, and then cut upon so as to let it out through the walls of the sac and scrotum. The probe is pulled through, but the tape is left in the wounds, the canula being withdrawn. The seton is to be continued for a week or more, until the requisite inflammation has been provoked. I have employed the seton in several cases, but not always with success.

Evacuating the hydrocele, and then harshly rubbing the scrotum for the purpose of developing inflammation, might be followed by a cure, yet such a course is more likely to be attended with failure.

A severe blow upon an unevacuated hydrocele has frequently resulted in the absorption of the fluid and a permanent cure. Hiram Jenks had a large hydrocele, about the cure of which he consulted me during the war, but deferred having an operation performed until an impending draft had been passed, as the disease exempted him from military service. In the course of a few months the tumor accidentally received a heavy blow, which was followed by a degree of inflammation that demanded antiphlogistics, and kept the patient in bed for a week. Not many days after Mr. Jenks resumed his usual avocation, he informed me that the hydrocele was getting smaller. In three months from that time all the fluid had disappeared, and there has never been a return of the disease.

In the event that a hydrocele is very large it is well to evacuate the tumor, and then let the sac partly refill before a cure is attempted by tapping and the injection of iodine. The precaution of a preliminary evacuation is to reduce the size of the cavity to be subjected to the influence of a powerful irritant. It is also the part of discretion not to inject the emptied tunic when, after tapping, it is found that the testicle is diseased; but the patient is to put up with temporary relief until it is found that the testis is not affected with a morbid condition which would be aggravated by a moderate degree of inflammatory action in one of the coverings of the organ.

Although hydrocele of the cord, and of the tunica vaginalis, in children usually disappears spontaneously, a needle may be used to puncture the tumor when no change for the better can be observed after two or three months. The punctures serve to evacuate the fluid gradually, and to excite absorption. To satisfy the anxious minds of parents I have prescribed iodine inunction; and the cure which at length followed has been ascribed to the treatment, when, in fact, it may have occurred as quickly if no medication had been employed.

Cystic disease of the testicle is an occasional malady which may be mistaken for hydrocele. Spermatozoa have been observed in the contents of some of these cysts, therefore it is suspected that the epididymis may have discharged some of its contents into the tunica vaginalis, or cystic developments in connection with it. The cysts themselves may be offshoots from the diseased lining of the spermatic canals. Spermatozoa have been discovered in ordinary hydrocele, but it can hardly be supposed that the tunica vaginalis has produced them. It is more probable that cystic disease of the epididymis existed in connection with the morbid action that produced the hydrocele. The treatment for cystic disease of the testicle or epididymis is substantially the same as that for hydrocele. When it is found that several cysts are present, they may be evacuated with a small trocar, and injected with iodine. If small ones exist they may escape attention, yet soon grow to a size that warrants operative interference. The patient, in such cases, may suppose that the operator had failed in his endeavors, but he can be made to understand that the disease is not subdued until all the developing cysts have been treated. In some instances the nest of cysts is so numerously filled that the prospect of exterminating them is not brilliant; but they may at length develop so slowly that little inconvenience arises from their evolution.

HÆMATOCELE.

In shape and general appearance, hæmatocele does not differ from hydrocele, yet it is darker in color, and is not translucent. An admixture of blood and serum distends the tunica vaginalis, and imparts a dusky hue to the scrotum. The disease originally may have been a hydrocele, but as the result of a blow, blood has been extravasated, and mixed with the serum, in greater or less proportions. The hemorrhage may have been a mere oozing, yet in time the accumulation is great enough to constitute a predominating feature in the contents of the tumor. When drawn off the blood may be in clots, or undergoing degeneration, therefore its flow through a canula is apt to be sluggish and irregular. If wholly decomposed, the more liquid part escapes in a free current, and a pasty mass of granular matter may remain behind. If the hæmatocele has existed for some time, the tunica vaginalis is generally found to be thickened, and the testicle is more sensitive than usual. In some instances the albuginea gets involved in active disease which may eventuate in loss of the testicle. Should the tumor present the usual outline of a hydrocele, the inference is that the disease is confined to the tunica vaginalis, but if a varying shape be presented, with a lobular projection here and there, the testicle or epididymis is likely to be diseased. It is best to wait in doubtful cases, before operating, lest a malignant testicle be punctured under the impression that a hæmatocele exists.

The ordinary treatment of hæmatocele is to evacuate the contents of the tumor with a good sized trocar and canula; but no irritating fluid is to be injected into the sac, especially at the first tapping. If only a small quantity of fluid is drawn off, and a probe introduced through the canula discovers masses of coagula, it is best to make a free incision into the tumor, and turn out the clots with the finger. Perhaps suppuration will follow, yet a cure will be likely to result. When most of the fluid is evacuated by the use of the trocar, the patient should rest a few days, and then use a suspensory bandage until a re-accumulation calls for a second tapping; and when the fluid becomes clear, or is only tinged with the coloring of blood, the operator may venture to inject the emptied sac with the tincture of iodine. Even then the patient should be carefully watched, and undue febrile excitement held under restraint.

EPIDIDYMITIS.

The exciting causes of epididymitis are urethral irritation, blows, pressure, prolonged sexual excitement without emission, and urinary troubles. It is rare for a man to pass through the different stages of gonorrhœa without suffering more or less from epididymitis. Injuries sustained in horseback exercise, and falls astride a fence, are common causes of orchitis and epididymitis. It is not easy to account for the affection as a sequence of urethral irritation, unless it be through "sympathy" or "metastasis," and those terms do not convey a satisfactory solution of the complication.

Epididymitis is often quite distressing,—the pain in the testicle, heaviness in the scrotum, and aching in the back, groin, and thighs, becoming too serious to endure without taking the recumbent posture. The epididymis is enlarged and excruciatingly sensitive when manipulated. In time the scrotal integument gets red, and tender to the touch. The sufferer experiences a sickening sensation, and a disposition to support the scrotum and its contents. The course of the spermatic cord is full and painful, sometimes leading to the suspicion that strangulated hernia exists. Serum and lymph are exuded into the tunica vaginalis, and even into the dartos, so that considerable tumefaction exists in the scrotum. After an inflammatory period of several days, the morbid action subsides by resolution, all parts implicated resuming their usual phases and functions. Suppuration is fortunately rare. The epididymis is apt to remain somewhat enlarged and more than ordinarily sensitive; and a man who has undergone one attack, is liable to experience another upon slight provocation. The treatment can generally be conducted without interfering with the patient's avocation. A suspensory bandage is necessary to sustain the weight of the testicle; and the application of hamamelis may assist in allaying the pain. If the inflammation run high, rest and a recumbent attitude will do much towards relieving the difficulty. When the trouble is persistent, the testicle must be subjected to the strapping process recommended for orchitis. Leeches do no good; and cathartics rarely accomplish anything desirable. In recurring forms of the disease it is well to use bougies in the urethra for awhile. Tender spots in the urethra which attend a spongy stricture, are apt to provoke epididymitis in the impressible or sensitive, therefore they should be subdued by the daily use of an elastic bougie of good size. A piece of camphor placed between the teeth at night, tends to allay sexual excitement, and thus indirectly to overcome the disease. Hydrate of chloral may do as well. The use of bromide of potassium during the day, may alleviate some degree of pain.

SCROFULOUS OR TUBERCULOUS DISEASE OF THE TESTICLE.

Chronic enlargement of the testicle generally depends upon the syphilitic infiltration of the substance of the gland; occasionally the morbid development depends upon cystic formations, giving a lobular character to the tumor-like testicle; and not unfrequently "sarcocele" arises from a scrofulous condition of the testicle, or tuberculous deposits in the substance of the gland.

Malignant sarcocele is characterized by persistent and excruciating pain in the testicle, an uneven or irregular growth of the organ, and the usual phases of cancer making progress in a gland, to say nothing of the systemic effects which are always marked in carcinomatous disease.

A testicle enlarging under syphilitic influences results in a tumor retaining the shape of the testis, but is heavy, cold, and painless. Even pressure does not produce painful sensations.

Acute orchitis is attended with enlargement of the gland, keen sensitiveness—the most gentle manipulation provoking excruciating pain; and the development of the disease is rapid. The integument of that part of the scrotum which covers the inflamed gland is very red, and inclines to adhere to the testicle.

A scrofulous or tuberculous testis may first receive deposits of cacoplastic lymph in the epididymis, but at length the rete testis and interspaces of the semeniferous tubes get filled and distended with granulo-molecular matter which bears the name of tubercle. The rete becomes enlarged and consolidated, and even the seminal tubules are involved or forced into a state of collapse by the encroachments of the tuberculous deposits. In fact, every tissue of the testicle may be distended by depositions of a yellowish-white, cheesy substance, which is denominated tubercle. The tunica albuginea is too dense to admit of much infiltration, yet it has to yield under the force of internal pressure caused by an increase of tubercular deposits, until it bursts, allowing the inner parts of the gland, together with morbid accumulations, to protrude. This constitutes one form of "hernia testis," as a protrusion of the internal structures of the testicle through a rent in the tunica albuginea is sometimes called. The tunica vaginalis, dartos, and scrotal integument may tear, and permit the inside of the testicle to protrude through the rent.

Tuberculous enlargement may affect both testes, though the disease develops earlier in one gland than it does in the other. And the scrofulous deposition may not stop in the testis, but extend to the vesiculæ seminales, prostate, bladder, and kidneys. Abscesses may form in any of the diseased organs just mentioned, and the ways of escape for the pus degenerate into sinuses and fistulæ. The avenues of escape for the purulency may be through the scrotum, perineum, rectum, and hypogastrium. I have seen two or three individuals who had urinary and fæcal cloacæ in the walls of the abdomen which resulted from abscesses developed in tuberculous deposits in the genito-urinary organs. The sinuses effected connections with the rectum and colon, and finally perforated the abdominal parieties.

The treatment for tuberculous enlargement of the testicle should be of that general character which is known to favorably impress scrofulous forms of disease. The administration of iron, arsenic, phosphorus, sulphur, the iodides, and vegetable tonics or alteratives, is known to arrest the progress of the disease and to induce cures in many instances. A feature of the successful management of the disease, is to promote digestion; and to so impress the lacteals and lymphatic apparatus generally, that the body shall be properly nourished. If the blood can be enriched, the flesh will increase, and tuberculous deposits disappear. When a patient can be made to gain in weight, there is evidence of improvement. The best "alteratives" are those which impart vigor to the nutritive processes.

Locally little can be done to diminish the size of a tuberculous testicle. The scrotum should be put in a good suspensory bandage; and that part of it which is contiguous with the affected gland may be anointed with a cerate which contains iodide of ammonium.

When there is a protrusion of the internal structures of the testicle—hernia testis—it may be best to excise the diseased mass. However, a patient is not likely to submit to such a radical measure until all known means of improvement are exhausted, consequently there is not likely to be a hasty and unwarranted castration in many instances. Recoveries have taken place without excision in cases which, at a certain period, may have appeared quite unpromising.

COMPLICATED DISEASES OF THE TESTICLE.

Cystic, enchondromatous, and carcinomatous diseases of the testis are occasionally combined in the same gland. In one instance I tapped several cysts, the evacuations affording some relief for a year or more; then an indurated state—scirrhus—followed; and, finally, a carcinomatous condition appeared. This led to excision of the diseased mass, which, when carefully examined, presented a few cysts not larger than a pea, and these contained a cancerous infiltration. In the mediastinum testis were enchondromatous developments, and in the immediate vicinity were earthy or osseous deposits. The part of the morbid mass that was decidedly carcinomatous, embraced the globus major of the epididymis, yet so distorted that the original structure could not be recognized. A fungous projection through the scrotum, which declared the cancerous nature of the disease, led to the excision. The patient made a good recovery, and was alive and well two years after the operation.

The testicle, like the ovary, is occasionally the seat of dermoid cysts, which develop bone, skin, hair, and teeth. The osseous masses, which may consist of true bone, are generally of irregular shape, and uneven on the surface; the dental formations may have crowns and fangs like ordinary teeth, but crooked and disposed in a disorderly manner; the hair is often well developed; but the nails are abnormal in appearance. These formations may be found in the testicles of new-born children, and have been considered as the result of "fœtal inclusion," or the imperfect germs of a second fœtus, but it is more satisfactory to regard them as extraordinary products of dermoid cysts.

FIBROUS TUMOR OF THE TESTICLE.

In two or three instances I have met with fibroid tumors of the testicle. They usually originate in the tunica albuginea, but at length transform the entire testicle into a dense fibrous mass. Growths of this kind are not painful, but they may become too heavy to be carried without dragging sensations. The suspensory bandage palliates the chief annoyance. Constitutional remedies do little good, though the iodides are reported to have reduced the size of the tumors. When a fibroid development of the testicle is not inconvenient on account of its size, it may be safely let alone, as it is not likely to degenerate into a malignant disease. But when a fibroid tumor of the testicle is troublesome by reason of its weight and the space it occupies, the tincture of iodine may be injected into its substance to the depth of half an inch or more, with a common hypodermic syringe, or a little larger instrument of the kind. The nozzle of an aspirator, and a vulcanized penis syringe, can be employed to puncture a fibroid testicle and inject it. In one instance I thus reduced a testicle that was as large as the fist to near its normal size. Five or six injections, a month apart, accomplished all that was demanded or seemed to be necessary. The operative procedures were not attended with great pain, shock, or much constitutional disturbance.

CANCER OF THE TESTICLE.

Malignant disease of the testicle, complicated with other morbid phases, has already been alluded to. But not unfrequently scirrhus and encephaloid forms of carcinoma attack the testicle, as they do the mammary and other glands. The symptoms of the disease, when manifested in the testicle, are not essentially different from those observed in other parts of the body carcinomatously affected. The organ becomes progressively enlarged and indurated, and the tumor exhibits nodular outgrowths. The veins of the scrotum present a dilated appearance, and the tumor exhibits a disposition to blend with the scrotal covering, or to convert every adjacent tissue into its own kind of structure. The pain and sensitiveness are not so great as those unacquainted with cancer of the testicle might suppose. A scirrhous state of the testicle may continue without marked changes for several months, but as soon as the encephaloid form is reached, the tumor grows rapidly, and changes in outline. Soft and fluctuating spots appear, and tempt the inexperienced to plunge a bistoury into them. Should the mistake of puncturing these yielding projections be committed under the impression that a fluid of some kind was ready to be evacuated, the incision might not heal, but a fungous development would be liable to make its appearance in the wound.

As the disease progresses, the general health of the patient suffers, as during the development of carcinoma in other regions of the body. In the early stages of cancer of the testicle, the systemic disturbance is so slight that those who rely upon " cachexia " as a necessary associate of cancer in any part of the body, may be led to declare that the disease is not cancer. The well nourished and florid, who seem healthy and robust, thus giving promise of a prolonged and vigorous existence, are as prone to cancer of the testicle as the emaciated, feeble, and cachectic in appearance. In cases of doubt whether a disease of the testicle is cancerous or not, there is usually nothing lost by waiting until some developing feature determines the true character of the malady.

The treatment for cancer of the testicle is excision as soon as the nature of the disease is known. If the case be not seen until the disease, in its local manifestations, has extended along the cord to the inguinal region, or the cavity of the abdomen is invaded, an operation of any kind is useless, and to be condemned.

CASTRATION.

The operation of castration is not difficult of execution, nor dangerous to life. It is best to make a free incision in the scrotum in order to secure drainage for the wound. Inexperienced operators are prone to remove the testicle through too small a wound in the scrotum. It is well to commence the incision as high as the spine of the pubis and terminate it at the bottom of the scrotum. This affords an opportunity to manipulate the cord, and leaves no pouch at the lowest part of the scrotum to collect and retain fluids. If the integument be sound, and not involved in the disease, none of it may be removed, but if the reverse be the case, a large quantity of the scrotum may be included in an elliptical incision which shall embrace all the morbid structures. After the incisions are made, the tumor is to be enucleated from the dartos, little dissection being necessary. When the spermatic cord is reached at a point above the disease, it may be ligated with a strong ligature, and then divided with scissors or a knife. If the ligation be not well done, the spermatic cord, by shrinking, may loosen the ligature, aad permit hemorrhage. I think it is better to separate the cremaster muscle, some connective tissue, and the vas deferens, from the vascular portion, and only ligate the latter. The separation is to be performed, and the ligature applied, before the knife or scissors be used to divide the cord below. Some operators insist upon ligating the spermatic and deferential arteries after a division of the cord has been made, an assistant holding the part of the cord which is left, while the operator seeks the arteries in the divided end of the stump, and ligatures them. But this is attended with trouble and risk of hemorrhage. In one instance that came under my observation the assistant let the cord slip out of his fingers, and it quickly recoiled within the inguinal canal, giving great annoyance to find it, meanwhile much blood was lost. In another instance there was troublesome bleeding from small arteries that did not show themselves while the patient was under chloroform. It is well to leave both ends of the ligature quite long in order that a retracted cord may be dragged into view, should occasion require such a procedure. It is proper to turn out of the scrotum any coagula that may have formed there, and then place the edges of the wound in apposition without sutures or adhesive strips. The scrotum is to be laid on a cushion of some kind, to support it. The patient is to be placed under an anodyne at once, and kept from suffering pain until the ligature has come away and the wound has chiefly healed. The following mixture is a favorite with me as an anodyne to be employed in the management of patients who have undergone surgical operations.

℞ Camphor water, f℥ij.
Chloral hydrate, ʒi.
Sulphate of morphia, grs. ij. M.

S. Dose, a tea-spoonful, to be repeated every four or six hours, and oftener if necessary. The medicine tends to diminish nervous shock, and to restrain tendencies to peritonitis. The wound is to be subjected to the water dressing, unless the discharges become offensive, when a solution of salicylic acid or a dilute preparation of carbolic acid, is to be employed. The ligature usually comes away by the time the wound is nearly healed. If there seems to be an unreasonable delay in any case, a little jerk or gentle traction on the loose ends of the string will pull it away.

An undescended testicle sometimes is found in the inguinal canal, and a hernia in conjunction with it. In such a case a truss-pad affects the testicle unpleasantly, hence castration becomes an essential part of the cure. In two instances I have cut into the inguinal canal and excised the undescended testicle. In these cases I threw a ligature around the cord above the dwarfed testicle, and then divided the spermatic attachment with scissors. In both examples the patients recovered without untoward symptoms; and the inflammatory exudations obliterated the inguinal canal to an extent that no hernial protrusions afterwards appeared. A solution of salicylic acid should be placed in such wounds twice a day to prevent septicæmia. A poultice should not be employed in the dressing of a wound produced by castration unless its under surface is medicated with salicylic acid, or other disinfectant, to prevent the development of fermentation, and attacks of erysipelas.

The operation of castration has been attended by tetanus, but probably not oftener than the amputation of a finger. Erysipelas and tetanus may attend any condition of traumatism, therefore surgical wounds of all kinds are more or less liable to unpleasant complications. It is not rational to shrink from the performance of an operation because one case in a hundred turns out unfavorably. The most unpromising cases often do well, while an operation upon a robust person occasionally turns out unsatisfactorily.

At one time castration was practiced to overcome the habit of self-abuse, and epileptic seizures, but I believe ths cures have not been frequent enough to warrant a repetition of the distasteful mutilation. The instances were few in which the moral and intellectual status of the castrated individual was bettered; and in exceedingly rare examples were epileptic paroxysms prevented, or even mitigated.

A century ago castration was performed to cure hernia. A French medical journal reports an aged individual who was emasculated at two years of age as a remedy for hernia. The eunuch was small of stature, womanish in appearance, and possessed no beard, yet he had served as a soldier, and fought bravely in many battles.

Mr. Curling reports a case of a man who lost one testis by castration, and subsequently the other on account of disease of the testis. In ten years after complete emasculation, the individual was wholly impotent, sexual desire and ability both departing.

ATROPHY OF THE TESTICLE.

After an attack of mumps, with affection of the testicle by metastasis, it is not uncommon for the testis thus morbidly impressed, to undergo atrophy. Impotence has followed a metastatic affection of both testes.

Masturbation has often resulted in an atrophied state of the testicles; and in sexual incapacity. Victims of self-abuse are apt to complain of a lack of development in the penis and testicles, and of sufficient erectile power to execute the copulative act, therefore matrimony might not be advisable as a means of cure.

It is not uncommon for those who abstain from venery, and for those who indulge in sexual excesses, to suffer from irritable and neuralgic testicles. Sir A. Cooper was induced by the urgent requests of three patients, to perform castration that they might get rid of unbearable pains in the testicles. It seems to me that such a procedure would be unwarranted, until other means of relief had been exhausted, and prominent among the means is the proper exercise of the function of the seminal glands. The use of a bougie has relieved irritable and painful testicles. The employment of opium suppositories in the rectum has also accomplished all that could be desired.

VARICOCELE.

A state of dilatation of the veins in the spermatic cord, and the upper part of the testicle, is called varicocele. The morbid state is confined mostly to the left testis, and is so common that a left spermatic cord and testicle that is free from some degree of varicocele is the exception. Young men at the ages of puberty, and at a period just following, during which the sexual system is irritable and excitable, are almost sure to complain of unpleasant dragging sensations in the left testicle, and of an enlargement of the spermatic cord on that side of the body. The defect or derangement is not always brought on by masturbation, though that habit is apt to aggravate it. Not unfrequently a sufferer applies to a venerealist or a truss vender for relief, thinking perhaps that he has a sexual disorder or a hernial protrusion. The scrotum and testis feel flabby or doughy, and the cord impresses the fingers of the manipulator as if a bundle of earth-worms were enclosed in the mass.

The disease, according to Brinton, comes from an imperfect valvular arrangement at the junction of the spermatic and renal veins on the left side of the body, though the point is not fully established. The alleged is a plausible cause.

With careful discrimination there is no danger of confounding varicocele with hernia or hydrocele, though such mistakes have been made.

The treatment for varicocele consists in the use of a good suspensory bandage, and the employment of tonic and astringent lotions to the relaxed parts.

Surgical treatises usually contain descriptions of several operative methods for the radical cure of varicocele, yet none of them are devoid of danger from erysipelas, phlebitis, tetanus, or pyæmia—accidents which generally arise from the puncture-nature of the wounds inflicted, and from the subcutaneous strangulation of the veins. A ligature—even if it be made of virgin silver—twisted tightly around vessels beneath the skin, will produce irritation enough to call out fluids which have no means of escape except through the opening in the integument occupied by the ligature. Therefore, it is my opinion that a subcutaneous strangulation of the enlarged veins is more hazardous than ligation applied through a free incision in the integument. But fatal consequences have followed all kinds of strangulation of the spermatic veins, though the degree of danger is diminished by an open incision at the point of constriction.

To shun the risk incurred by all of the well-known operative procedures, I have excised a segment of the varicose veins, and used no ligatures or sutures. I make an incision an inch in length along the course of the cord about half way between the external abdominal ring and the bulge in the scrotum produced by the testicle. The hair is snipped off before the incision is made. A fold of the loose integument is raised by the thumb and finger along the course of the spermatic cord, and the crest of the fold is incised, including skin, dartos and whatever fascia is grasped. The wound is then spread with the fingers, and the true spermatic fascia seized and incised. The dilated veins may now be separated from the vas deferens, nerves, arteries and other structures of the cord. After the varicose plexus has been well isolated and brought out of the incision, scissors are used to excise a segment of the veins, by dividing the vessels in two places, each a half inch from the other. The operation is not attended with excruciating pain, and the hemorrhage is never profuse. In fact, the size of the dilated veins has little influence over the amount of blood passing through them. Besides, vessels cut with scissors do not bleed so persistently as when divided with a knife.

If the divided veins do exhibit a disposition to bleed, the bleeding ends may be compressed with the thumb and finger for a few minutes, or until the hemorrhage ceases. I can assure the most timid that there is no danger of exhausting hemorrhage.

After the operation is performed, and the hemorrhage, if there be any, has ceased, the edges of the wound are to be laid together, and a wet compress applied. If chloroform has been used, as it may be with irritable and apprehensive patients, the reaction from its effects may start afresh a hemorrhage which has been checked, therefore the surgeon is not to leave his patient too soon, lest he be re-called to arrest what the patient and attendants may consider a dangerous bleeding.

The patient should keep the recumbent posture for three or four days, when, if everything be favorable, he may be dressed and take moderate exercise. Of course, the scrotum should be supported by some kind of a suspensory apparatus, when the patient assumes the upright attitude. The wound will suppurate moderately, and heal by granulation. No sutures being used, the traumatic condition is rather simple; and the wound being open there is little danger of pus burrowing in the scrotum. After the healing process is complete, a suspensory netting should be worn to afford comfort, and to prevent, as far as may be, the dilatation of other veins. It is not to be supposed that all the veins in the spermatic cord become varicose, therefore when one set is obliterated or occluded, enough are left to convey the blood, and even to reproduce the original difficulty. Occasionally a patient *radically cured*, may, some years after, need a second operation.

I have operated many times in the manner described, each case proving a satisfactory success, and no untoward circumstance interfered with the healing process. In the rare cases of varicocele needing an operation, I feel like commending the plan described. The operation is easily performed, and there is no danger of seriously disturbing vessels or structures proximate to the varicose veins. The excision obliterates the dilated vessels as circulating media, and does not interfere with the functions of the testicle or spermatic cord. The wound is too unimportant to admit of dangerous complications; and is attended with less pain and shock than other operative procedures designed to accomplish the same result. An anodyne may be needed the first night to ensure rest, but, after a day or two, the patient considers the operation an insignificant affair.

AFFECTIONS OF THE SCROTUM.

The loose tissue of the scrotum renders it liable to serous infiltration. New-born children not uncommonly present an œdematous condition of the scrotum. The difficulty arises from the effects of acrid urine, or other irritation to which those parts are so much exposed. The use of soft and frequently renewed diapers, and a drying powder, is followed by a return of the tissues to their natural state.

Ulcers of the scrotum, which sometimes are uncomplicated with a venereal taint, have been known to become phagedenic, and rapidly destroy a large patch of integument in a few days. Even when the entire scrotum has been destroyed, laying bare the testicles and spermatic cords, the reparative processes have quickly produced a tegumentary covering for those structures. The greatest subsequent trouble comes from the testicles being forced high into the inguinal region by the cicatricial tissue. This does not impair the function of the testicles, but a tense feeling in the region has to be endured. The application of carbolic acid or chlorinated washes, generally checks the ulcerative process at once. An erysipelatous condition of the scrotum is dangerous, and should be watchfully treated with remedies employed to arrest the progress of the disease in other parts of the body. I have found carbolic acid would check the progress of the destructive influence, also liquor sodæ chlorinatæ, both being employed in dilute forms.

When the scrotum and penis are greatly encumbered with œdematous infiltration in general anasarca, it is well to make punctures in the distended and distorted integument, and thus allow the serum to drain off. The small wounds produce little pain and no subsequent trouble.

Elephantiasis scroti is an affection which is rarely seen in the white races, but the disease is common in the black and mixed breeds of tropical climates. The affected integument appears coarse, thick, and akin to the hide of a river-horse, though more oleaginous. The hypertrophy is confined to the scrotum, the testes not being affected. The growth attains a monstrous size in the course of time, the mass weighing as much as the rest of the body. A similar disease—ichthyosis—occasionally attacks the integument of the leg, when the pachadermic structure hangs down in great folds over the toes, and quite graphically represents an elephant's leg.

Scrotal elephantiasis cannot be cured by any known course of medication; and excision is a dangerous remedy. Dr. Titley, in the *Lancet*, vol. xx, reports having excised five or six monstrously enlarged scrotums, all in the negro race, in the island of St. Kitts; and he claims that all the patients recovered except one.

Tumors of the scrotum weighing fifty pounds have been successfully removed. When the integument of the penis and prepuce is involved in the excessive growth the operative procedure is not easy of execution. The knife has to be directed so as to leave the penis free, and plenty of integument for its covering. Incisions on each side of the spermatic cords, leaving a wide space between them as they descend below the testicles, are to preserve coverings for the testes after the main part of the scrotum is removed. A transverse incision below the testes connects the two parallel incisions, and two flaps are turned up over the inguinal region. The testicles and spermatic cords are next turned upward and held there, together with the penis, by an assistant, while the operator severs the tumor with wide strokes of the knife. The hemorrhage may be fearful, but if the larger vessels are nipped and twisted with forceps, the smaller ones soon cease to bleed, and the danger is passed. The elevated penis, testes, and tegumentary flaps are next let down, and the edges of the wounds so adjusted with sutures that the testicles shall have a covering, and the penis a free movement. Although much diseased integument is retained, it gradually returns to its normal state, or, at least, approximates that condition. The incisions interfere with the vascularity of the diseased tissue; so that instead of hypertrophy being apparent, atrophy prevails in the disordered structures. The turned up flaps that are to become coverings for the testes should be six inches long and wider at their bases, than they are at their upper extremities. A space on the under side of the penis is denuded, but when the edges of the wound are brought together, the organ has a tegumentary covering. The thick flaps do not make a nice covering for the testicles, but it is the best which can be obtained, unless flaps of abdominal integument are turned down and made to cover the testes.

Delpech removed a tumor of the scrotum which weighed fifty-four pounds, not estimating several pints of serum discharged from the incisions during the operation. The operator fashioned the flaps from the lateral and posterior aspects of the upper extremity of the tumor, which he used to cover the testes and the under surface of the penis after the scrotum was removed. The patient made a good recovery.

Mr. Walton, in the London *Medical Times and Gazette*, reports a case in which he tied the scrotum in small segments close to the trunk, and removed the mass below the ligatures; then, as each strangulated part was liberated, the vessels were secured. The mass removed weighed eight or nine pounds. The patient recovered.

M. Clot-Bey regards elephantiasis as a local affection, distinct from lepra; the principal phenomena being tumefaction, hypertrophy, and inflammation of the skin and subcutaneous tissue. The above writer and observer believes the disease incurable ex-

cept by removal; and advises an early operati
scrotum is generally of the epithelial variety
be the bane of chimney-sweeps, though the evi
is not unquestioned. Dr. John C. Warren,
Tumors, declares that he has never known a c
have the disease, yet he has met with it in a
that business. English writers declare that
provokes the disease, if it does not originate
James Earle reports that a gardener was in th
a soot-bag on his forearm, and an epithelia
where the bag rested. Mr. Curling mention
cinoma of the scrotum, which are not ascribe
of soot.

Epitheliomata of the scrotum are mostly cur
excision, which would imply that the disease
or slightly constitutional. If the disease be al
the lymphatics of the groin, serious results ma
some instances the scrotum seems to be conv
culated or warty mass, with scarcely any ulcer

Mr. Humphrey reports a case of epithelial
tum which appeared long after the person ha
avocation of chimney-sweeping. It is not
filthy condition of the scrotum favors the deve
excrescences and intractable ulcers, many of wh
regarded as cancerous without substantial evide
really such.

AFFECTIONS OF THE PENIS.

Venereal diseases constitute nine tenths o
the penis, but there are occasional defects and
organ that require consideration as a class o
distinct from gonorrhœa and syphilis. An
with a small orifice in it is a congenital affectio
relieving soon after birth, or as early as it is
spadias and hypospadias, with or without extro
are not marvelously rare, as may be instanced
unfortunates of this kind who present them
the various medical colleges of the country
alms.

Modified phases of hypospadias frequently
they are remediable. I was once called to see

in a Dunkard family, whose urinary meatus existed on the under side of the penis, and whose prepucial frænum connected with the scrotum. There was no obstacle to the free flow of urine, but the glans penis was drawn downward and retracted as in chordee. As this state of the organ prognosticated embarrassment if left till adult life, I used a knife to free the abnormal connection with the scrotum; and directed the attending physician to so manage the dressing of the wound from day to day as to prevent a union of the parts severed. The operation was performed six or seven years ago, and I have since learned that the penis stands out freely when erect, and no impairment of function in after life is anticipated.

Two years ago I was requested to operate upon a child a year old, whose penis on its under surface was attached to the scrotum, even the glans being held fast to the scrotal furrow in which the penis was embedded. I feared, in this case, that a severance of the two organs would prove futile, inasmuch as there would be a disposition for the healing surfaces to unite, therefore I drew a piece of leaden wire through a perforation made between the scrotum and the penis near its root. I bent the two ends of wire together, to form a ring. This was left in place for two or three months, to establish an opening similar to that in the lobe of the ear which is made for ear-rings. When the canal was an open passage, the physician in attendance dissected the penis from the scrotum, the previously established aperture being the terminus of the incision from the end of the penis backwards. By keeping the penis and scrotal traumatic surfaces apart, the wounds healed without a disposition on the part of the healing processes to re-unite the severed organs. Without the tegumentary boundary produced by the leaden seton, no amount of care and attention would have prevented partial or complete reunion. The child has now as free and mobile a penis as could be desired.

Occasionally a second meatus urinarius exists an inch or so behind the normal one, the opening being in the floor of the urethra, near the scrotum. A case of the kind came under my observation, but the young man having the defect refused to have a trial made to close the abnormal meatus. The urine mostly passed through the adventitious aperture, and also the semen. Probably in the event of copulation, no semen would be lodged within the vagina.

EPISPADIAS AND HYPOSPADIAS.

When the floor of the urethra is congenitally wanting for some distance behind the point for the normal meatus, the defect is denominated *hypospadias;* and if the upper part of the penis is wanting, and the roof of the urethra, the term *epispadias* is used to denote the character of the deficiency and malformation. The lesser forms of these difficulties are not necessarily distressing; but in their worst phases, the deformities, together with functional impairment, are disgusting and pitiful.

Extrophy of the bladder is often associated with epispadias. In such a case the anterior half of the bladder is wanting, and also as much of the abdominal parieties as corresponds to the posterior walls of the bladder, which protrudes in front of the surrounding integument, and presents a bright red tumor that throws off an abundance of mucus. Still further, the ureters open upon this exposed vesical surface, and the urine trickles down constantly, rendering the sufferer terribly offensive to himself and to the world. In some of these cases of hypospadias the defective penis is so short and retracted, and the scrotum, which is bifid, is so drawn up on each side—appearing like the labia of a female—that the sex of the individual may be questioned.

Hermaphrodism is the term employed to signify the combination or blending of the two sexes in one individual; but it is somewhat doubtful whether both sexes are ever united in a single person. The victim of genital malformation may be regarded as a female at birth, and be reared and treated as such, but upon careful examination after adult life is reached, it has been found, in almost every instance, that the subject has malformed male organs. The *British and Foreign Medico-Chirurgical Review,* 1841, vol. xxxv., reports a case of the kind. The account of it is translated from the *Journal de Montpellier.* M. Benoit was consulted by Marie B——, 27 years of age, and registered in one of the towns of the department of Tarn as a girl. When 14 years old she became aware that there was some peculiarity in the conformation of her genital organs, and she therefore applied to a medical man, who assured her parents that a simple operation would set her all right. An incision was made for the purpose of re-establishing the vagina; but this not being found, nothing was done. Shortly before consulting M. Benoit, she had been asked in marriage, and at first refused the offer; but as her lover persisted in his addresses, she at length declared the cause.

The account which she gave to M. Benoit was as follows: When about fourteen years old, she observed in the right inguinal region a small swelling which was very painful for some time, but at length disappeared. Although she suffered considerably from headache, languor and general uneasiness, there had never been any sanguineous discharge. Below the mons veneris, which is altogether similar to that usually observed in women, there is a fissure terminated on each side by two thin corrugated labia, which are slightly covered with hair, and stretches backward towards the anus. This fissure is only about three quarters of an inch deep; its anterior commissure terminates in a diminutive penis-like organ, which is provided with a prepuce, a glans, and two cavernous bodies, but is without any terminal aperture. It is subject to erections, and becomes then considerably longer. At the root of this organ, on the inferior surface, there is an opening which communicates with the urethra, constituting, therefore, the *vitium conformationis*, known by the name of hypospadias. This opening, at rather less than three inches from the anus, leads into the bladder by a canal which is curved, as in the male subject; but is only about three inches long. When a sound is introduced into the bladder, and a finger passed up the rectum, there seems to be only a thin septum between them, but not any trace of a prostate gland. In one inguinal region there is a small round and movable body under the integuments.

From this state of parts, M. Benoit gave it as his opinion that the sex was male, and that his patient was incapable of contracting marriage.

Instances of duality in sex, or real hermaphroditism, are frequently reported, but there is reason to question most, if not all of them. Casper, who is the highest authority on this subject, says: "A true hermaphrodite, that is, a double set of organs with the functions of both sexes united in one individual, is never found in the human species. Pretended facts of the opposite character to be found in the earlier writers on the subject are based upon mistakes." In what have been called "female hermaphrodites" the male sex exists, yet in such a deformed state that the accoucheur committed the error of pronouncing them females, and they were educated as such; and occasionally misfortunes have happened after puberty from the faulty decision. A German periodical records a case in which two servant girls roomed together, and one of them became pregnant by the other. An investigation proved that one of the servants, Johanna K., was afflicted with the malformation of hypospadia, or was a male hermaphrodite. The child presented the same deformity in its genitalia. The *Lancet*, a few years ago, reported a similar accident which occurred between two female servants in an English household.

Casper, in his *Forensic Medicine*, vol. iii, page 251, Sydenham edition, says: "I know of no example of an impregnation effected by a man afflicted with epispadia; and I have only to repeat that epispadia is in itself a very rare malformation, and almost never occurs alone, that is, simply as a normal opening of the urethra superiorly.

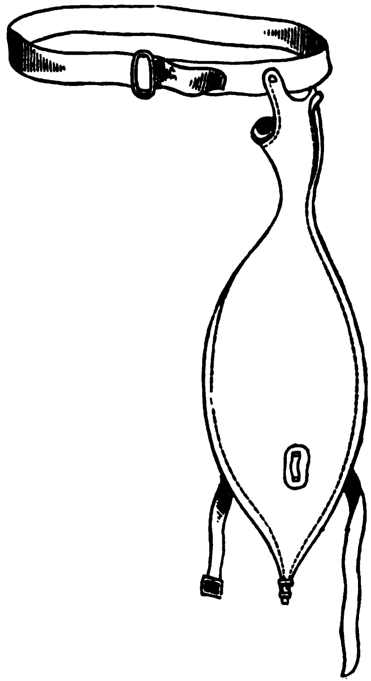
"According to the present state of our knowledge and experience, however, the following dogma in regard to capacity for procreation possessed by those afflicted with hypospadia, and epispadia, may be laid down, where the formation otherwise is that of a normal male:—hypospadia and epispadia of themselves form no reason for assuming an incapacity for procreation, so long as it cannot be proved in any given case that it is impossible for any semen to enter the vaginal canal,—as for instance, when the urethra opens perpendicularly upon the perineum."

In the *Am. Jour. Med. Sciences* for Oct. 1852, is the report of castration by Prof. S. D. Gross, upon a child three years old that had been pronounced a "girl" by the accoucheur, though the grounds for the decision rested almost entirely upon a bifid scrotum and a hypospadic penis. It was a case of malformed male genitals, and no female feature existed. The operator removed the testes as an humanitary act and to prevent misfortunes! Dr. Taylor, in his *Medical Jurisprudence*, stigmatizes the procedure as a "most unjustifiable operation, consisting in an attempt by castration to destroy all sexuality in an infant, because that infant had been already so unfortunate as to be born with imperfect sexual organs!"

Extrophy of the posterior wall of the bladder is associated with epispadia, and imperfect development of the pubic bones. The bulging and exposed surface of the bladder exhibits the terminal openings of the ureters and the seminal ducts. The testis of one side is usually descended, and may be associated with hernia; on the other side the testis remains in the abdominal cavity, which contributes to the belief that that side of the body is female! The umbilicus is situated lower down than usual, and its mark may be found at the top of the chasm in the parieties of the abdomen where the bladder protrudes.

Efforts have been made to form an anterior wall of the bladder by dissecting flaps from the neighboring integument and sliding them in front of the protrusion, but no surgeon has yet succeeded in doing more than establishing a tegumentary bridge over the mucous track. In one instance a pouch was made below the open ureters that held an ounce or two of urine, yet it could not be voided, and would slop out when the patient sneezed or coughed. At one time considerable improvement was expected from anaplastic surgery in the way of remedying extrophy of the bladder, but the mechanicians have accomplished the most. They have constructed a silver shield that fits close to the pubes and abdomen. This part of an apparatus collects the urine as it drips from the ureters. A nozzle at its inferior part admits the attachment of a piece of rubber hose which conducts the urine to a rubber bag or urinal lashed to the lower part of one of the thighs. This has a discharge-pipe regulated with a cock, so that the urine may be emptied when convenient. Persons suffering from extrophy of the bladder, epispadias, and lack of union of the bones at the pubic symphysis, are rarely capable of performing hard labor; and often degenerate into vagrants who exhibit their malformation for pecuniary consideration. Hypospadias is a defect in the lower wall of the urethra, which may range from a penile fistula to an arrest of development that implicates the penis, stunting it to little more

FIG. 168.



Rubber urinal.

than that part of the glans which is above the meatus. The scrotum may be bifid, and the halves drawn upwards in the direction of the inguinal canal. The urethra, which is about the length of that duct in the female, opens on the under surface of the root of the penis. The seminal ducts terminate near the urinary outlet.

The urine may be retained in the bladder until a quantity is collected, and then voided at will. In some instances of hypospadia the urine cannot be controlled by the sufferer, and he is obliged to wear a urinal.

An opening in the urethra on the under surface of the penis may be closed by a plastic operation, or by freshening the edges of the opening, and closing the aperture with silver sutures. To an inexperienced person the operative procedure is so simple that success in a majority of instances might be looked for; but good operators know how liable such proceedings are to failure. Sometimes it is necessary to introduce a silver catheter, and then freshen and close the abnormal aperture over it.

Urethrotomy signifies cutting into the urethra, or establishing a passage for the escape of the urine when the meatus becomes obliterated from some cause. A young man came to me for surgical relief, who was suffering from the effects of a burn in childhood. The meatus and a half inch of the urethra were so distorted and contracted through cicatrization that the urine escaped drop by drop; and the patient carried a piece of knitting needle, with which he dilated the contorted passage two or three times during micturition. So much pain and trouble attended these efforts that the sufferer determined to seek relief. I carried a probe through the tortuous track, and then cut upon its point from the under side of the penis. I made an aperture as large as the urethra, and the urine passed through this in a full stream. After a few weeks all the urine escaped through the artificial outlet, and no inconvenience attended micturition through the new channel.

Cancer of the penis is usually of the epithelial variety, and corresponds to that form of disease in other parts of the body. It commonly manifests itself upon the glans in the form of a warty excrescence that may resemble a venereal growth, yet the history of the case helps to interpret its true character. If the disease attack the prepuce, and it generally will, the foreskin becomes distorted with fungous growths. The glands of the groin enlarge and become painful, as in syphilitic demonstrations. The gradual extension of the growths and ulcerations, embracing glans, prepuce, and urethra, distinguishes the morbid manifestation from venereal evolutions, though the distinction is not easily drawn at first.

Epithelial cancer of the penis may be successfully attacked with chloride of zinc paste, or with any escharotic that effectually destroys the disease in other regions of the body. When the morbid manifestation is confined to the prepuce, circumcision is the quickest and best way to get rid of the local disorder.

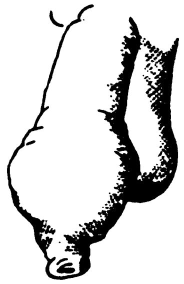
When a cancerous affection begins on the glans, and spreads to the urethra, as well as to the cavernous and spongy structures, amputation of the penis is justifiable. The operation is performed easily by a circular sweep of the knife, the integument being drawn neither forward nor backward, lest there be too much or too little remaining. The wound bleeds freely from several arteries and from the erectile tissue. The dorsal artery needs ligating, and such others as persist in bleeding after a few minutes compression. If the patient has been under an anæsthetic, the stump will need watching for some time to guard against renewed hemorrhage after it has once been subdued. The stump will granulate and heal without other treatment than the use of a simple cerate and a stall or lint wrapping. The skin puckers to a narrow circle surrounding the urethral orifice. If at length the urethral aperture contract to a calibre that will not admit the ready issue of the urine, the passage may be slit and drawn laterally with sutures. The use of bougies may prevent the orifice from contracting to an inconvenient calibre. A patient who has suffered amputation of the penis for the relief of cancer of the organ, should be treated systemically, for a year or more, with acid solution of iron one day out of three, Fowler's solution of arsenic the second day, and phosphorus the third.

AFFECTIONS OF THE PREPUCE.

The foreskin is often so long, and has such a narrow orifice, that circumcision is desirable to relieve the inconvenience of such a state. The difficulty is often congenital, and may be hereditary. I have operated upon three sons in one family, the father of whom had been circumcised in infancy. The young men did not apply for relief until they were over twenty years of age, and contemplated matrimony. The orifice in the foreskin was so small in each of these cases that the glans could not be uncovered. This state of the prepuce is called *phimosis;* an opposite condition is where the prepuce gets behind the corona glandis, threatening strangulation of the organ, and is called *paraphimosis.*

Phimosis may be accidental, or acquired, a lesion of some kind causing the prepuce to swell, or to become indurated, so that it can not be retracted. Venereal diseases are a common cause of phimosis, but may not lead to circumcision. In the management of venereal diseases it is sometimes necessary to administer an anæsthetic in order to retract the prepuce behind the corona glandis. The dangers from chloroform are too great for a physician to incur the risk with none present but himself and patient, yet the nature of a venereal case is such in regard to secrecy that a physician would be justified, under the circumstances, in administering an anæsthetic alone, or without witnesses. When the prepuce is forcibly retracted to examine a venereal sore, it should be returned again as soon as the ulcer is cauterized, or a paraphimosis may be induced.

FIG. 169.



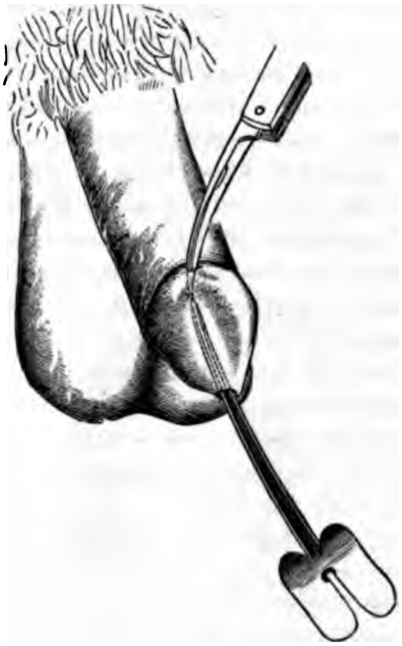
Phimosis.

The accumulations of foul secretions beneath an unretracted foreskin, might lead to inflammatory action, and adhesions between the lining of the prepuce and the glans penis. However, the sulcus is not wholly obliterated, space enough being usually left for the reception of venereal poisons. Circumcision, practiced as a religious rite, renders a people more nearly exempt from venereal diseases, than is attained by the uncircumcised of our race. Balanitis usually arises from the accumulation of irritating secretions under the prepuce, through want of cleanliness.

In congenital phimosis, it is not uncommon to see the prepuce bag out as if filled with wind while the child is urinating. This condition comes from the fact that the orifice in the prepuce will not discharge the urine as fast as it is furnished by the urethra.

The only cure for phimosis consists in slitting up the prepuce from its orifice to a point where it covers the corona glandis; or in excising the front segment of the foreskin, care being exercised not to wound the meatus or glans in the operation. The Jewish method of performing circumcision is to invite a circle of relatives and friends as witnesses, and an "official" to execute the practical part of the rite. The Rabbi draws the foreskin of the child as far forward as practicable, and then with a long knife cuts away the greater part of the covering. The pain is considerable, and the blood flows freely. To arrest the hemorrhage, wine and water are applied, and in some instances the operator takes the bleeding organ between his lips, as a means of arresting the hemorrhage. It is rarely necessary to use a styptic, but the mutilated penis is wrapped in a soft fabric. The child is then delivered to its mother, and the friends indulge in the festal bounties of the occasion.

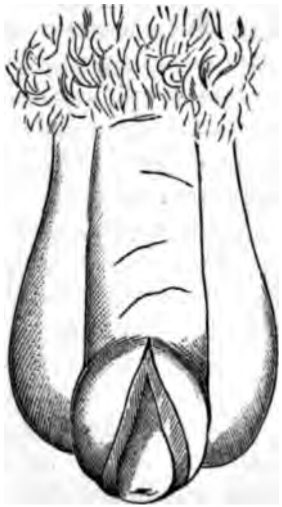
FIG. 170.



Operative procedure to overcome phimosis.

The best way to get clear of phimosis is to carry a grooved director through the prepucial orifice, and as far back, between the prepuce and the glans, as the corona glandis. The entering extremity of the instrument is then made to show where it is by pressing upwards a little. The point of a bistoury is now made to transfix the foreskin, and plant itself in the groove of the director.

FIG. 171.



Split in the prepuce made to relieve phimosis.

Nothing remains to be done except to carry the knife forward until the prepuce is split along the course of the director. The two halves of the foreskin are then turned to each side, and the lining membrane at the upper end of the

cut is thrown over the elevation of the coron
wards remains. The hemorrhage is rarel
never dangerous. The halves of the split p
sightly ridge along the glans and frænum, b
shrink, and all redundancy disappears, leav
less deformity than when the circular cut is
heals in two or three weeks, and the penis b
of having its foreskin retracted, but not exc

Although I have the authority of Fergusson, Lee, and other reputable surgical writers against me, I have found no necessity for the employment of sutures to unite the integument and lining of the prepuce along the borders of the wound; nor have I obtained satisfactory results when I have cut a slit a half inch in length, instead of carrying the incision as high as the corona. I have made the short cut, and found it left more deformity than the long one; and I have used sutures, but did not secure so natural an appearing border as when none were employed.

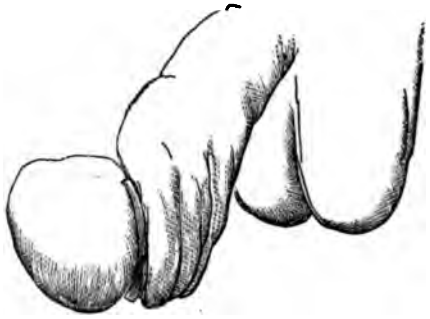
The split
the

Paraphimosis occurs when a small orifice
the prominent ridge of the corona glandis; a
the circulation is impeded by the constricting
cial orifice. Tumefaction takes place from t
lymph and imprisoned blood; and the cons
into a furrow, so that it is difficult to reach
danger to the strangulated glans from ulcera
gangrene is not inconsiderable. Paraphimo
boys who retract the prepuce and leave it
glandis until they are unable to replace it.
situation, they may not make known the sea
until it is a matter of some difficulty to re
examined a penis suffering from paraphimosis
behind the corona,—the one next to the gla
mucous membrane, and the other of integ

depth of the furrow between the ridges is the constricting medium.

Paraphimosis may be relieved in most instances by giving the patient chloroform, and pulling the prepuce down by placing the thumbs on the end of the penis and the fingers behind the tegumentary ridge, force being used to replace the foreskin. The penis of a boy six or eight years old is too small to manipulate well in this way, therefore it may sometimes be necessary to carry the point of a narrow knife to the bottom of the furrow just described and there divide the constricting band. A knife with an edge at the point only, is the best to divide stricture; but if the adjacent structures do get wounded a little they will heal by the time the soreness occasioned by the strangulation has passed off. Tissues distended with serum may be punctured, to evacuate the fluid, yet as soon as the prepuce is returned to its natural position, the œdema will soon subside.

FIG. 173.



Paraphimosis.

A vesicular affection of the foreskin, confined mostly to the orifice, and called *herpes* prepucialis, is an unpleasant disorder which consists chiefly in vesicles that break and form little cracks or fissures which exude an ichorous fluid that dries in crusts, and irritates the sensitive structures morbidly impressed. The affection is attended with considerable itching which induces scratching and rubbing, and so the disease becomes aggravated by the rough usage it provokes.

An herpetic affection of the kind described is not difficult to cure. The use of a lotion composed of rose water and glycerine, equal parts, to which is added a moiety of Fowler's solution, will generally soften the parts and neutralize the poison in a few days.

A light touching of Meyer's ointment may do as well, or even better in some instances. Citrine ointment, ten times reduced with simple cerate, is also a good remedy.

DISEASES OF THE PROSTATE GLAND AND BLADDER.

The pelvic organs are so closely joined, and intimately associated, that a disorder of one may disturb all the rest. Organic or functional disorders of the kidneys are likely to exert a disturbing influence over the bladder, prostate, and urethra. Then, again, urethral stricture may disturb the functions of the kidneys and bladder. The sympathy between the urinary organs is so great that it is often troublesome to determine which segment of the urinary track is primarily and principally disordered. In a given case of suspected vesical disease the urine is to be tested with litmus paper, filtered, evaporated, and microscopically examined. Pus, albumen, and mucus, are to be scrutinized; and a rational estimate made of their origin from the subjective symptoms. Urinary deposits are to be chemically analyzed in order to find what is the character of the matter predominant in the urine. The sound is to be employed to ascertain if there be calculi in the bladder. Renal forms and casts of the ureters drop into the bladder, and pass the penis with the urine, therefore everything voided should be submitted to special scrutiny. *Hæmaturia*, or blood in the urine, may depend upon cancer or other disorder of the renal apparatus. The bladder may be the source of the sanguineous extravasation, though pain in the renal region point to the kidneys as the source of hemorrhage. A calculus impacted in the pelvis of the kidney will frequently prove the cause of blood in the urine; but how can the cause be discovered? The signs of disease may not be notably different from those which attend a hemorrhagic condition in other parts of the urinary apparatus. Blood which springs from the kidney is apt to be decomposed and thoroughly mingled with the urine, while blood springing from the walls of the bladder or neck of the organ is generally fresher and in clots. If the hemorrhage arise from malignant disease, the urine at length becomes loaded with shreds, flocculi, and the debris of the disintegrating disease. When the hæmaturia springs from the walls of the urethra and from the anterior portions of the prostate the blood comes in a pure state, or unmixed with urine. The use of a catheter, bougie, sound, or other exploratory instrument, not unfrequently provokes a show of blood, and occasionally a lively hemorrhage, even though great care be exercised in the manipulation of the instruments. The "breaking" of a chordee is followed by an alarming flow of blood. Violent exertions during sexual congress have been attended with hemorrhage. The passage of a calculus may scrape and abrade the urethral lining to an extent that there may be a hemorrhagic show. Worm-like clots, which are casts of the urethral canal, may be voided with the urine; and they are generally larger and stronger than those coming from the ureters. It is to be borne in mind that rhubarb, logwood, and some other medicines color the urine, and thus raise the suspicion that hæmaturia exists, when really it does not. The detection of a blood corpuscle with a microscope will determine a question in doubtful cases.

Hæmaturia springing from the kidneys may be checked or arrested by the internal use of logwood, pinus, hamamelis, and astringents that do not irritate, if the case be remediable. Bethesda mineral water, drank in large quantities, has cured many cases of hæmaturia, yet it is not always a specific, nor should it be expected, for the causes of bloody urine are various. When the hemorrhage comes from the bladder, that viscus may be injected with a weak solution of salicylic acid and borax. But if the disease provoking the hemorrhage be of the prostate or neck of the bladder, the introduction of a catheter, through which washes are used, may aggravate the cause and prevent a cure. A neuralgic state of the bladder attending some varieties of hæmaturia, is to be allayed by the internal use of gelseminum, chloral, and opium. One of the best methods of allaying pain in the pelvic viscera, is to inject laudanum and a solution of starch into the rectum.

Cystitis is a common affection; and a disease not always easy to relieve. The seat of the morbid action is in the mucous membrane, though the entire vesical parieties may become involved. Cystitis may come from the kidneys and ureters, and from the urethra, as that which follows gonorrhœa. The invasion is ushered in by rigors, feverishness, and an uneasy feeling in the penis and bladder. There will be a disposition to urinate frequently; and the flow over the urethral surfaces will be attended with a scalding sensation, and sharp pain in the starting and stopping of the stream. The desire to void urine comes on suddenly, and is too imperative to be disobeyed. The frequency of the calls during the night breaks the patient's rest, and the continued distress soon wears out the strongest constitution. Often the urine is acrid and gives off a rank odor. The best treatment for ordinary acute cystitis consists in the employment of laudanum and starch in the rectum, and hot applications to the hypogastrium. The internal medication may comprise sulphate of magnesia, pinus canadensis, buchu, gelseminum, sweet spirits of nitre, and such agents as do not irritate the stomach. The patient must not indulge in excesses of any kind for a long time, or the disease, partly subdued, will return with renewed violence.

Chronic Cystitis is a common form of disease; and may be known by irritability of the genito-urinary organs, and an abundant secretion of mucus which soon settles in any vessel in which it may be voided, showing a heavy cloud at the bottom. In some cases there is an admixture of pus with the mucus. Persons annoyed with nocturnal emissions are apt to suffer from chronic cystitis,—also elderly persons who excrete acrid urine, and have a calculous tendency. Those who have partial paralysis are prone to exhibit evidences of chronic cystitis. Venereal excesses and the exhaustion attending prolonged sexual excitement are common causes.

The treatment consists in improvement in the digestive functions, abstinence from all that is exciting, stimulating, and exhausting, and the use of iron and vegetable tonics. Probably pinus canadensis will benefit a greater variety of cases than any other remedy. Washing out the bladder with a weak solution of carbolic acid tends to improve some cases. A laudanum and starch injection thrown into the bowel at night helps the course of cure immensely.

Ulceration of the bladder is attended with a copious discharge of pus with the urine, and a desire to pass water every few minutes, night and day. The pus settles in the bottom of the vessel in which the urine is voided. The disease is perplexingly obstinate, if not absolutely incurable. Blood is occasionally passed with the urine; and shreds of cast-off mucous membrane float in the liquid. The patient is harrassed with pains in the hypogastrium, loins, and legs.

There is no relief except in laudanum and starch injections, and in hot applications to the perineum and hypogastrium. Anything spicy taken as food or medicine aggravates the disease. Warm and astringent fluids thrown into the bladder through a catheter may do some good; but unless the manipulation be conducted with gentleness, the instrumental interference may do harm.

Hypertrophy and sacculation of the bladder constitute a formidable disease. The inexperienced practitioner may, upon meeting his first case, think that he has an excellent opportunity to display his skill, and prove the efficacy of his favorite medicines; but in the end he will be disheartened. His diuretics, and specifics for urinary disorders, will effect nothing beneficial, and may do harm.

The organic derangement consists in an immense thickening of the walls of the bladder; and in the rugose and sacculated state of the mucous membrane. Although the substance of the bladder is hypertrophied, the cavity of the viscus may be so much diminished that it will not hold an ounce of urine without producing a feeling of distension. The sacculi not unfrequently become the receptacles of sandlike sediment and calculi. In some cases the cavity of the bladder is not diminished, but increased by the processes of growth and dilatation.

There is no cure for these states of the organ, yet something may be done from time to time which will add to the patient's comfort and possibly prolong life. The treatment is substantially the same as that advised for chronic cystitis. Acids and alkalies may be tried in alternation; and injections of a dilute solution of permanganate of potash might be employed with some advantage. Buchu, pareira brava, hyosciamus, gelseminum, uva ursi, and kindred remedies have been recommended, but I can see no benefit arising from their use. Large doses of iodide of potassium may stay the progress of the disease.

Tumors may grow in the walls and from the mucous lining of the bladder, as well as in the parieties and mucous membrane of the uterus. Occasionally a villous, vascular, or polypoid growth may be detached from the walls of the bladder, and after decomposing, escape as debris with the urine. A lithontriptic instrument may be employed to grasp, crush, and detach a tumor projecting into the cavity of the bladder.

Malignant disease of the bladder is a distressing morbid state; and, as in carcinoma of the uterus, there is no cure, and no substantial relief. Evidences of the presence of the disease consist in pain, hæmaturia, fullness in the anus and rectum, swelling of the hypogastrium, and irritability of the bladder; as well as the constitutional impressions which are so marked as to be rarely misinterpreted.

Paralysis of the bladder comes from over-distention of the organ; and is a sequence of partial or general paralysis. The disorder is attended with retention of uriné, or dribbling of the renal production. For the former state the catheter must be employed; and for the latter there is little relief except what may be obtained from the use of a urinal.

Those paralyzed individuals who are confined to bed may use an earthen vessel or narrow crockery dish, which rests between the thighs, and catches the urine as it drops from the meatus of the penis. The chief hope of improvement consists in a bettered condition of the general disease. An unpromising case will sometimes improve, while a case that does not seem serious will grow worse from month to month, and from year to year, until the vital powers utterly fail, and death seems to be welcome.

Incontinence of urine is a defect of childhood, though it may occur at any period of life. Children during infancy always pass their urine without the exercise of any will; but when they arrive at four or five years of age they may be taught to exercise a control over the evacuation. If lack of restraint extend to advanced adolescence, the demands for relief are pressing. Enuresis reaching to the age of puberty distresses the mind of the sufferer to a degree that begets cowardice and disgust. If the course of incontinence could be traced to a single source, a specific remedy might be sought with a reasonable hope that it eventually might be obtained, but the disease is known to spring from varying causes.

Profound sleep, which relaxes the sphincters, is frequently conducive to an involuntary discharge of urine; parasites in the intestinal track may provoke enuresis; irritability of the bladder is a common cause; and insensibility, or partial paralysis of the sphincter vesicæ must necessarily be attended with urinary incontinence.

Either sex is liable to enuresis, but girls are affected oftener and nearer to puberty than boys. The defect is somewhat peculiar to families, several of the children in each generation being sufferers.

Children troubled with incontinence of urine should be instructed in habits of regularity, whether in eating, drinking, taking exercise, or going to bed. A sufferer from incontinence should avoid getting exhausted either at work or play. Parents retiring at a later hour than a child of theirs which may be troubled with enuresis, should awaken the heavy sleeper, and enforce the importance of emptying the bladder, to avoid the shame and discomfort springing from wetting the bed.

The remedies that have some repute as preventives of incontinence are belladonna, santonine, lupulin, sulphur, phosphorus, and pinus canadensis. The latter does well in some instances; but a better effect may be obtained from the employment of the following prescription :

℞ Simple syrup, f℥iij.
Fluid extract of buchu,
" " " pinus canadensis, aa. f℥ss.
Muriated tincture of iron, fʒj; M.
S. Dose, teaspoonful every three or four hours.

The above compound will benefit persons advanced in life, who, from one cause and another, suffer from dribbling of the urine. When the trouble arises from paralysis, little benefit need be expected from any kind of medication.

The prostate gland is liable to a variety of diseases and disorders. In old age the part of the organ which is adjacent to the bladder becomes hypertrophied, so that a thick ridge exists at the inferior aspect of the cervix vesicæ. A bar may be said to form there which prevents a free flow of urine, and is in the way of the passage of a catheter. A moderate development or hypertrophy of this part of the gland, may not be considered as actually morbid, any more than certain other changes in the body which are peculiar to an advanced stage of life. However, in the event that the prostate becomes inflamed or swollen, the easy and ready flow of urine is impeded; and a catheter cannot be passed without considering the bar in question. The point of the instrument, for a half inch or so, should be bent to the segment of a smaller curve, or a finger in the rectum should pull downwards and outwards for the purpose of depressing the prostate and straightening the urethral passage through it. An irritable state of the prostate is to be managed much the same as cystitis.

Abscess of the prostate is to be managed much as the organ should be when beset with inflammation. Emollients and opiates are to be thrown into the rectum with a syringe, and the bowels are to be kept in a solvent state. The presence of pus is to be determined by the *tactus eruditus*, the finger being carried into the rectum for the purpose of feeling the fluctuation. And when once felt, the wrapped blade of a bistoury is to be sent along the finger to the spot selected for puncture, and then a thrust should be made in the direction which may make an aperture in the purulent cavity. It is not difficult to make the evacuating incision. When once emptied, the sac collapses, and fills by the ordinary granulating and reparative processes. If the abscess breaks into the urethra, or through the perineum, there is danger of a urinary fistula being established.

The prostate is liable to tuberculous infiltration, to development of cysts, and to malignant diseases, but these disorders do not require special descriptions, nor definite methods of management. Much has been written about a hypertrophied state of the organ, but a somewhat extensive experience in the dissecting room does not warrant me in holding to the opinion that every old man who suffers from disorders of the pelvic viscera, has a troublesome enlargement of the prostate.

CATHETERISM.

A catheter is ordinarily introduced into the bladder without difficulty; but cases are not rare in which the highest order of skill and tact is baffled. Not unfrequently futile efforts are ascribed to strictures of the urethra and enlargements of the prostate, when lack of success should be charged to defective instruments. Certain it is that the most experienced operators possess and employ the greatest variety of catheters. One kind of instruments is not suited to a multiplicity of morbid conditions. A metallic catheter of proper curve and caliber, is the best adapted to the majority of cases. The size of the instrument should be sufficient to slightly distend the urethra. A catheter which is too small catches in the folds and sinuses, and readily makes false passages. A large instrument smooths the folds of the urethra and passes over pouches and pockets without danger of entering them. Elastic catheters in common use lack firmness, and are liable to break. If used at all they should be employed without stilettes, and be tested as to strength and finish before introduction. An elastic catheter of French construction, and having a short curve near the entering end, is about the only flexible instrument that is fit to be employed. This catheter can sometimes be introduced when a metallic instrument meets with insurmountable obstacles.

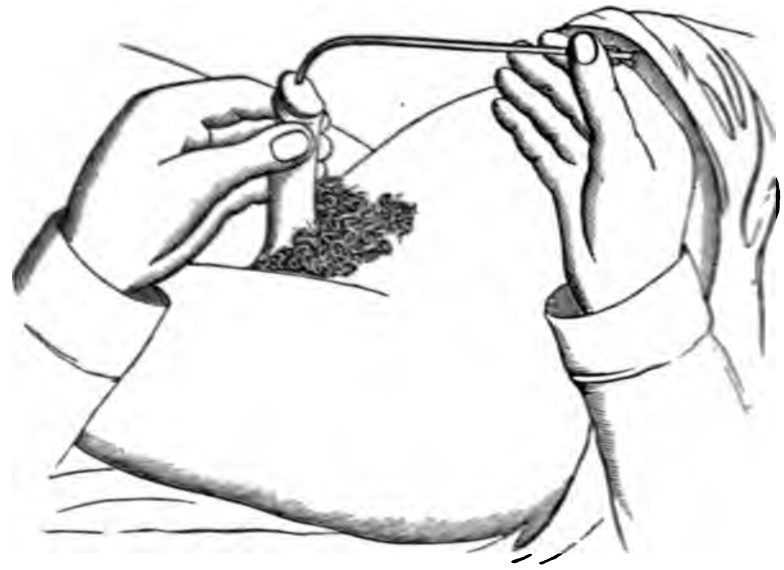
A vertebrated catheter, so called, is costly and rarely useful. It is designed to penetrate indurated and sinuous tracks, yet in cases seemingly favorable for its successful employment, it has signally failed in good hands.

A metallic catheter should have several small holes on one side near its point, and a large elliptical opening on the other side. The rings usually found near its outer extremity are really put there to attach tapes when it becomes desirable to retain the instrument in the bladder; but placed upon the sides of the catheter at right angles with the general course of the instrument, they serve to indicate where the point of the catheter is while being introduced.

The curvature which ought to be given a catheter has been a subject of much discussion. A perfectly straight instrument can be carried through the crooked urethra if the introduction be accompanied by rotation. However, the pressure exerted upon the floor of the membranous and prostatic portions of the urethra endangers the making of a false passage. If properly curved a catheter provokes little pain, permeates readily, and inflicts no injury. The important curvature begins at the point of the instrument and extends through about one-fourth of its entire length, and in such a manner as to form an arc, the chord of which is three or four inches in length, and the radius from one to two inches. A second curvature in the opposite direction near the middle of the instrument, but only in a slight degree, is a favorite with some operators. A moderate curvature of this kind appreciably lowers the point or beak of the instrument, and favors its introduction in some instances. A heavy catheter can be bent without danger of breaking, but a silver instrument made of scanty materials, will not endure bending without flying open at the line where it is brazed.

The position of a patient to be catheterized is that of ordinary *decubitus*, the legs being moderately flexed and the thighs separated. A bed or lounge will do for the patient to recline upon. The operator stands upon the left side of the patient; and with the left hand he uncovers the glans and offers the meatus to the catheter which is held lightly in the fingers of the right hand as is a writing pen. The outer end of the instrument is directed across the right inguinal region when the point is entering the meatus, but soon is made to assume a perpendicular attitude in the median line, and finally to drop between the thighs and get into the axis of the lower pelvic strait. The introduction of the catheter is facilitated by gently stretching the penis with the left hand, as if to slide the organ upon the catheter,—no force of importance is used by the right hand to push the catheter along its way. When the beak of the instrument has reached a point directly beneath the symphisis pubis it has to permeate a small opening in the *triangular* or *infra-pubic ligament*, and meets with some resistance there. However, the operator soon overcomes this by gentle efforts of the two hands—the one manipulating the penis and the other the catheter: and the instrument then passes easily to the prostate; and by the same careful tact the outer end of the catheter lowers and the point rises and enters the bladder. The urine now flows freely; and the thumb of the operator is made to act as a stopper until a vessel is suitably placed to catch the stream.

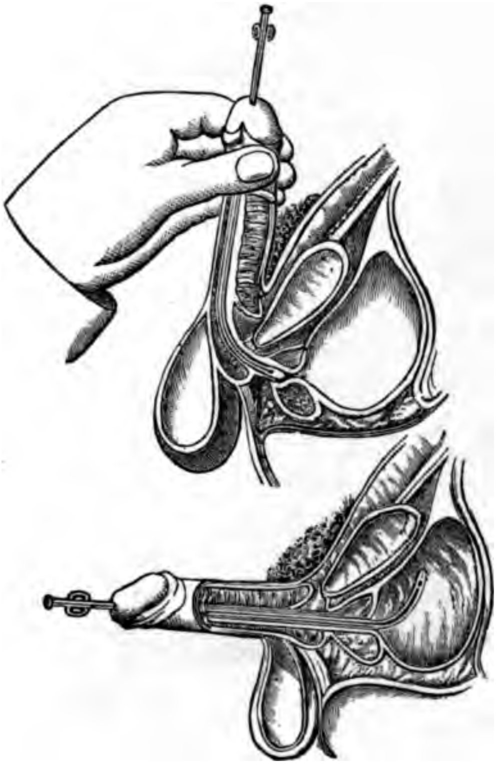
FIG. 174.



Catheterism commenced.

The difficulties of catheterism are numerous, and should be systematically considered. As a general rule the catheter meets with fewest obstacles when its beak or point is kept from pressing heavily upon the lower wall of the urethra—it better press moderately upon the upper wall as it glides along. A lateral deviation is easily detected and corrected. During the passage of the catheter through the deeper structures the fingers of the left hand are to occasionally raise the scrotum and explore the perineum with the object of identifying the beak of the catheter and of correcting any misapprehensions as to its position. If the point of the instrument has advanced too far to be felt through the perineum, and seems to meet with obstructions, the finger is to be carried through the anus into the rectum, where the prostate may be felt and steadied while the catheter is deftly pressed into the bladder. In a difficult case of catheterism the assistance rendered by the finger in the rectum is often of the greatest value. If the prostate can not be reached and manipulated, an advantage may be gained by locking the finger against the inside of the

FIG. 175.



The upper diagram represents the entering end of catheter near the bladder; and the lower shows complete entrance.

sphincter and pulling outwards, upwards or d
condition of the parts may seem to demand.
catheterism I rarely find the prostate enlarge
with a spasmodic state of the membranous porti
and induration of the prostate. The latter s
frequently with hypertrophy of the bladder.

Since the discovery of anæsthetics their use h
valued in rendering a patient fit for catheter
should be manipulated long in futile attemp
catheter, without being rendered insensible and
anæsthetic. In obstinate cases it is often neces
chloroform in order to bring success within the

As soon as a catheter enters the bladder th
becomes free, moving easily from side to side, a
forward. But if there be no urine in the bladd
will flow through the instrument, and the co
vesical walls may hold the catheter quite firmly
dence of introduction. The presence of a blood
and anterior part of the bladder may obstruct
and impart a rigid sensation to the catheter.

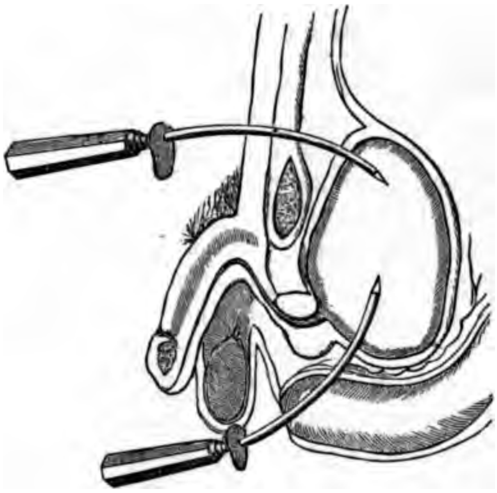
Tumors of the recto-vesical region may ele
and thereby render catheterism extremely diffic
Sometimes over-distention of the bladder ca
rise above the brim of the pelvis, the organ a
quence of its repletion, the shape of a bottle wi
wards. Under such circumstances the cathete
and well curved, and the finger in the rectum i
downwards as the catheter is made to advance.

Finally, there are traumatic and pathologica
ineal and pelvic regions which may render cathe
Rupture of the urethra and indurated strictur
dable obstacles to successful catheterism. Ur
abscesses of the prostate constitute difficulties
which test the skill of the most expert surgeon
to introduce a catheter. Occasionally it ma
evacuate the bladder through a perineal section
incision being directed by a small bougie or
Maisonneuve. Puncturing the bladder with a
through the rectum, in the median line, betw
seminales, is practicable, but to be avoided if p
pubic incision and puncture constitute a m

the bladder, but such an operative procedure has its serious objections.

When the necessity exists for evacuating the bladder through the rectum, the point of the instrument is to be slid along the forefinger which has previously been introduced into the rectum, and when the median line behind the prostate has been reached, the puncture may be made with a bounce. As soon as the trocar is removed the urine, if the bladder has been entered, will flow freely through the canula. As soon as the bladder is empty, the canula is to be removed; and urine will then find its way through the aperture into the rectum, and be discharged with fæces. This manner of evacuation may be continued until the puncture closes, or the urethral route is opened.

FIG. 176.



Bladder tapped through the rectum and above the pubes.

Puncturing the bladder above the pubic bones is somewhat dangerous on account of the facility with which urine infiltrates the loose cellular tissue below the perforation. The puncture is made just above the pubic symphisis, as represented in the accompanying diagram, the peritoneum being out of reach above. An incision should be made in the skin to facilitate the entrance of the trocar. The canula empties the bladder readily, but should not be left in place to create irritation and to do other mischief. The drainage through the wound is not as free as when the bladder is tapped through the rectum.

Retention of urine which demands puncture of the bladder, usually arises from acute inflammation of the prostate, therefore relief can generally be obtained in a few days through suppuration or subsidence of the swelling. If the retention come from hypertrophy of the bladder, the difficulty is serious,—a fatal termination being in order through various complications. Heat and moisture applied through the agency of fomentations to the perineum the vapor of burning alcohol, and sitting in hot water, will often overcome spasmodic stricture, and vesical contractions that prevent a flow of urine. Dry heat at a temperature as high as can be borne, may be applied to the hypogastrium with advantage when the retention is of a character to be overcome by manipulation and mild means. Attitude of the body may favor easy micturition. An old man leans to pass his urine in a stooping posture.

URINARY CALCULI.

The formation of gravel and stone in the kidneys, bladder, or urinary passages, is sufficiently common and important to command the attention of even those in the profession who have limited opportunities for practising surgery. Many calculous complaints, embracing the existence of stone too large for expulsion, are sometimes relieved or entirely cured by fortunate and skillful medical practice; hence the physician should be familiar with such diseases, and not without trial abandon them to the hands of the surgeon. To be sure, it requires considerable sagacity to determine the presence of a calculus in the urinary passages, and whether it could be removed or not, yet the most unpretending practitioner would hardly escape the censure and ridicule of the ignorant and unprofessional, if he should be careless or unfortunate enough to send a patient away to a lithotomist when there was no stone to be cut for.

The amount of literature and learning devoted to urinary disorders and calculous deposits, is so great that it is not practicable to give anything more than an abstract or synopsis of what seems of use to the general practitioner of medicine and surgery.

Urinary derangements tending to the deposition of crystalline matter, or to the formation of calculi, whether arising from a disordered state of the lungs, stomach, liver, or kidneys, or depending upon a peculiar condition of the body, called a diathesis, exhibit a variety of morbid phases.

The urinary excretion normally holds in solution, besides mucus and epithelial debris, certain substances which in other forms entered the body as food, became converted by the processes of assimilation into new forms and combinations, and at length, after having served the purposes of growth and repair, degenerated into waste or detritus destined to be discharged from the animal frame. These worn-out materials, in variable proportion, ordinarily find their way out of the body without any deposit or concretion being left along the urinary tracks. But an excess or deficiency of certain constituents of the urine, or the presence of an accidental ingredient to disturb the balance, tends to the precipitation or amalgamation of sedimentary matter.

Uric acid in a state of solution passes largely through the urinary apparatus unobserved, or crystallizes in the bladder as a "brick-dust" deposit. It may also combine with soda, potassium or ammonium, constituting the *urates;* or by further transformation, it may be changed into urëa and oxalic or carbonic acid and water.

Uric acid arises from albumen undergoing a physio-chemical action, just as sugar comes from starch by being subjected to kindred chemico-vital forces. Food and exercise modify the production of both.

Uric acid, if not discharged by the ordinary processes of depuration as fast as it accumulates, is liable to excite several pathological states, as gout, arthritis, rheumatism, and gravel. Children of gouty parents, it has been observed, are as liable to calculous disorders as to gout.

A superabundance of uric acid in the renal secretion renders the fluid higher colored than natural, and encrusts the vessel or utensil into which it is discharged. The crystals of uric acid do not always form while the urine is warm, but make their appearance as soon as it cools. The consolidation of uric acid or the urates into a stone, is effected in part by ordinary cohesion or chemical affinity, and in part by the presence of animal matter acting as a cement, as mucus, fibrine, pus, or epithelial scales. If these heavy substances do not become aggregated into a concrete mass, they may be seen, if a quantity of urine be collected in a vial, as a mucilaginous sediment, or as clouds and flocculi, imitating in appearance the alkaline or phosphatic productions. The difference between these varied compounds can only be determined by the most rigid scrutiny.

A profitable study of the urinary deposits requires experience in the use of the microscope. With that instrument the character of the crystalline and sedimentary matter can be pretty accurately determined, even when the ordinary chemical tests lead to nothing but confusion. Instruments for measuring the specific gravity of the urine, and careful observations of specimens subjected to a variety of temperature and exposure, contribute much to a definite knowledge of calculous diseases. The changes of the urinary fluid are so great under the varying influences of climate, diet, and mental and physical exertion, that a hasty conclusion, or one drawn from scanty data, would prove of little utility in the diagnosis and treatment of disease. A slight irritation of the urethra set up when the renal excretion is clear and normal, will soon impress the functions of the kidneys and urinary tracks to an extent which is manifested by a flocculent, cloudy, or sedimentary urine, with positive evidence of an increase of the urates or phosphates and their combinations. To fix upon the kidneys as the seat of the disorder in most instances of abnormal states of the urine, without inquiring into the condition of the urinary passages, genitalia, and other parts and functions of the body, would indicate a disposition to jump at conclusions.

Either from the decomposition of uric acid or from imperfect digestion and assimilation, or from eating and drinking vegetable productions—as grapes, rhubarb, currants, and the recently made wines—oxalic acid shows itself in the renal excretion. This acid unites with lime and other kindred substances in the urine, constituting the *oxalates*, which are capable of concretion, and of forming layers upon other calculi. The oxalates are generally regarded as a modification of the urates, though their origin and character are not fully determined. Another class of the urinary deposits is made up mostly of the *phosphates*. The constituents of these are generally eliminated in a perfect state of solution, but the phosphates of lime and magnesia, under certain circumstances or conditions of body, assume the concrete form. The alkaline phosphates into which soda and ammonia enter, are perfectly soluble, and do not readily admit of precipitation. Hence the phosphates of themselves rarely begin a calculus in the kidneys or bladder, but the presence of a foreign body, whether it be a uric acid concretion, clot of blood, or other compact substance, acting as a nucleus and irritant to the urinary passages, favors phosphatic deposition and encrustation.

A combination of the earthy and alkaline phosphates—as the ammonio-phosphate of magnesia—produces what has been called a *triple* phosphate, which occasionally falls in crystals, and by the assistance of mucus or other substances in the urine, may assume the concrete form, or encrust other calculi.

Although the above constitute the essential elements of the majority of urinary deposits and calculous formations, there are other chemical ingredients and organic matters present in greater or less quantities.

Two great classes, however,—acid and alkaline, urates and phosphates—practically embrace all varieties. The rarer forms of carbonates, and uric and cystic oxides, have been arranged by themselves as constituting a distinct class, but it is better to assign them a place with one or the other of the two in accordance with their proximate chemical relations.

The causes of urinary deposits are exceedingly varied. If the digestive functions be weak or perverted, or the food and drink be in excess, or unsuited to the bodily wants or habits of life, uric acid and the urates appear largely in the urine. A suppressed or vitiated cutaneous action, together with high living and too little physical exertion, particularly in persons with constitutional tendencies to gouty and arthritic disorders, is a cause or concomitant of acid deposits in the urinary excretion.

Seventy-five per cent of all renal and vesical calculi are of the uric acid character. Deposits containing the oxalates, for instance, the oxalate of lime, are supposed to arise from two sources: first, imperfect transformation or oxidation of albuminous substances; second, the use of food and drinks—usually of vegetable origin—which either contain oxalic acid, or substances readily convertible into it. Wine which has undergone partial fermentation is perhaps the worst beverage a person liable to acid gravel can take. Grapes and other juicy fruits which may ferment in the stomach, have similar tendencies.

Besides constitutional predisposition, called a diathesis, and the aggravating influences of diet and other physical causes contributing to sedimentary precipitation, there is generally a local cause, as a starting point, in the formation of stone in the urinary passages. Whenever the predisposition to calculus exists, a trivial cause brings it into operation. A blood globule, an insignificant particle of mucus, a microscopic portion of albumen, or an epithelial cell, is all that is requisite for the purpose.

The alkaline and phosphatic deposits as before suggested, depend not so much upon constitutional derangements and remote causes, as upon local affections of the urinary organs. Among the latter may be reckoned stricture of the urethra, and irritation of the bladder, whether caused by impairment of the nervous energy or by the presence of a foreign body in that viscus. The disturbance produced by acid calculi in the pelvis of the kidney, is often followed by an exhibition of the phosphates all along the urinary tracks.

Phosphatic calculi, or the ammonio-magnesian phosphates, are frequently induced by inflammation of the bladder. The inflammation gives rise to a copious secretion of mucus, which acting as a ferment, leads to the decomposition of urea and the evolution of ammonia; and, in turn, to the production of the earthy phosphates. However, without some local cause, even where the predisposition to calculus exists, no stone is likely to form. But if a piece of catheter, bougie, or other instrument, be accidentally lost in the bladder, or a bean, bead, pebble, or other smooth body, be foolishly pushed along the urethra into that cavity, it will prove the starting point of a vesical stone, just as a thread or anything else may form the nucleus of a crystal of sugar candy.

Without a nucleus, or foreign body, to act as a local cause, the urine would have to be heavily loaded with insoluble material to endanger the formation of stone. However, as the risk of a starting point is always imminent, a renal excretion charged to excess with matter liable to precipitation or concretion, indicates that the person passing such urine is in danger of renal and vesical calculi.

The *treatment* of urinary affections of the calculous nature has to a considerable extent been empirical, though the administration of acids and alkalies in cases where the various tests indicate an opposite chemical state of the urine, is *apparently* scientific.

The kidneys may excrete acid urine, but when the fluid is voided, it may have been rendered neutral or alkaline by the secretions of the urinary passages. Acid remedies would not be likely to benefit such a case.

Mr. Colles, in his lectures, speaks of a case of stone in a young man who was subsequently operated upon. Particles of the calculus which escaped with the urine, were sent to a chemist for the purpose of ascertaining what kind of treatment would be likely to dissolve the stone. Word was sent back that the case favored the use of acids. "Well," says Dr. Colles, "I tried acids, and the patient's symptoms got worse; I then tried alkalies, and he got better under their use; however, at his earnest solicitation, I operated on him, and the analysis of the stone proved that it was of that kind for which acids are recommended!"

If the usual tests exhibit undoubted acidity of the urine, and the microscope reveals an excess of uric acid crystals, it is generally better to correct the difficulty through the skin and stomach than to rely upon alkaline medicines. A free cutaneous action brought about by baths and exercise, removes more or less acid; and a vigorous digestion prevents acid accumulations in the blood and tissues. After the functions of the skin, lungs and stomach, have been established as perfectly as they can be by exercise, baths, emetics, and tonics, the kidneys may be stimulated by the use of ether, nitrate of potash, and other alkaline remedies and diuretics. These agents serve the double purpose of neutralizing the acid in the blood and textures, and of diluting and rendering more limpid the urinary flow.

The diet should be more vegetable than animal; yet so much depends upon proper digestion and assimilation, that farinaceous and saccharine food, if allowed to ferment in the stomach, may prove a fruitful source of uric or oxalic acid in the fluids and structures of the body. Albuminous substances should be prohibited unless the digestive apparatus can be kept in a condition favorable to their conversion and appropriation, and to oxidation on the part of the skin and lungs.

Persons claiming to have discovered effectual methods of dissolving renal and vesical calculi by the administration of internal remedies, have succeeded in obtaining rewards from those in official authority. In all instances, an imposition has been practiced, for no substantial benefit was derived from a disclosure of these vaunted remedies. Parliament once rewarded Mrs. Stevens for disclosing a secret for curing gravel and stone. Her prescription called for soap and egg-shells.

The injection of alkaline solvents into the bladder when it is known that an acid concretion exists, has been practiced with unsatisfactory results. Any fluid which is strong enough to successfully attack the concretion is liable to excite irritation or produce inflammation of the mucous surfaces. The urates and oxalates when consolidated into a vesical calculus, are quite unyielding to the action of the solvents or crushing instruments. As a stone is often made up of several layers—each perhaps of a different chemical composition—there is no reliable means of ascertaining when the alkaline wash should be discontinued, and another of an opposite character substituted. A lack of positive knowledge in regard to the nature of vesical calculi, must ever prove a barrier to the general use of solvents introduced into the bladder through the urethra. As previously stated, the alkaline or phosphatic deposits and concretions do not depend so much upon exercise, diet, and the digestive functions, as upon derangements of the genito-urinary apparatus, therefore they are to be successfully managed more by local than general treatment.

If the urine exhibit, upon standing in a vial or vessel, an abundance of muco-purulent clouds or sediments, and it be definitely learned that a positive alkalinity of the fluid exists, together with phosphatic precipitations or concretions, a strict inquiry and examination should be made into the condition of the urinary passages.

Stricture of the urethra, following gonorrhœa or masturbation, or inflammation of the urethra, bladder, or kidneys, may be the chief cause of the urinary difficulty, therefore the use of a bougie, wet packs to the perineum and back, or such topical agencies as the peculiarites of the case demand, should not be neglected. The administration of hydrochloric acid after meals, and bitter tonics, as nux, gentian, pinus canadensis, and hydrastis, several times a day, will prove decidedly beneficial. Let animal food be increased, and vegetable food diminished. Herbivorous animals have alkaline, carnivorous animals acid urine, hence it may be naturally inferred that the more the patient in diet resembles the carnivorous animal the less alkaline will be the blood, and the more acid the urine will become.

Phosphatic calculi are the most soluble, therefore in many cases an attempt should be made to dissolve the stone by irrigating the bladder with water acidulated with nitro-muriatic acid. Injections can be made through a common catheter several times a day, but a more speedy method is to employ a double catheter, so that a stream can pass in and out at the same time. If the temperature of the fluid injected be nearly up to blood heat, the patient does not experience any unpleasant sensations from even an hour's flow of the acidulated water. A large phosphatic calculus can sometimes be reduced by acid solvents until its size is more practicable for the use of lithontriptic instruments. Any fragments of stone left in the bladder to become the nuclei of other concretions, may be successfully dissolved, or brought to a size more favorable for discharge by the urethra. The indiscriminate use of diuretics in phosphatic difficulties of the urine, without regard to causes or consequences, results in more harm than good.

Unfortunately it can not be determined when a *renal* calculus exists. A concretion may be present in the pelvis of the kidney for years and give no sign of its existence, except occasional uneasiness, such as might arise from a variety of causes, and some blood now and then mixed with the urine. An attempt of the calculus to enter the ureter would be marked by more definite signs. The pain would become excruciating, and would not be likely to subside until the stone had reached the cavity of the bladder.

The suffering caused by the passage of a renal calculus through the ureter is to be relieved by all the means that lessen pain. The inhalation of chloroform may be kept up for hours, though not to the extent of profound anæsthesia. A moderate impression is all that may be necessary. Opium and hot applications will answer in cases where chloroform is not at hand, or is refused by the patient. The vomiting excited by the pain will generally cease as soon as chloroform or other agent deadens nervous sensibility. Diuretics will aggravate the distress if given before the calculus has reached the bladder.

LITHOTRITY.

Athough lithotomy is the quickest and most complete method of getting rid of a vesical calculus, and the one most in favor with English and American surgeons, the French are inclined to employ a lithotrite for the purpose of crushing a stone until, as detritus, it may pass through the urethra with the urine. It is well known that the late Emperor of France suffered from stone in the bladder; and that he took a "chill" and died soon after a lithotrity-sitting. And it has been asserted by those eminent in surgical authority that if the distinguished ex-ruler had submitted to lithotomy he might have survived the operation, and lived to old age. To this it may be replied that the mortality attending lithotomy is greater than that which attends lithotrity. On the other hand, successful lithotrity requires many sittings, all of which are more or less painful; and not unfrequently the procedure fails from various causes, and lithotomy has finally to be performed.

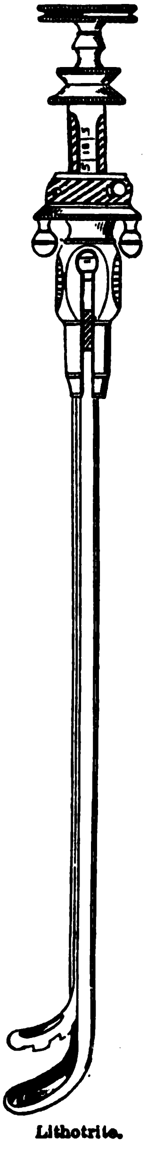
Lithotrity in some form was occasionally practiced centuries ago, but M. Civiale was the first to bring the operation within the limits of legitimate surgery. Amussat, Leroy d'Etiolles, Heurteloup, Coulson, and others, have written extensively upon the subject, and improved the instruments, so that any one, by following their directions, can execute lithotrity with a fair degree of success.

One of the reasons why lithotrity is not oftener attempted may be that the instruments are too costly for the ordinary surgeon, who can execute lithotomy without much expense. The smallest outlay for lithotrity in the adult subject would be for a single lithotrite, which costs about twenty dollars; a second instrument, of smaller dimensions for boys, would amount to as much as the first, so that the most restricted outfit amounts to a larger sum than every experimenter cares to incur. In my opinion the French lithotrite, which is represented in the accompanying diagram, is the best. It is slender, yet possesses sufficient strength and power to crush the hardest urinary calculus.

The instrument of Baron Heurteloup has three blades, and a drill between them for perforating the stone after it is once grasped. After several holes are drilled in the calculus, the shell can be easily crushed. Mr. Weiss, a London cutler, made an instrument which had a central rod that could be struck with a hammer until the stone crumbled under repeated blows. The lithotrite in common use is designed to seize the calculus upon one of its sides and then grind off some part of it by a sliding and crushing action. The detritus thus produced easily passes away with the urine. Repeated grindings, performed every three or four days, would reduce the stone so it might be seized in the middle and broken into pieces that could be still further reduced, and made small enough to escape through the urethra.

The modern lithotrite is shaped enough like a catheter to pass into the bladder. It has two blades or beaks which, when shut or closed, quite readily slide along the urinary tract, even the neck of the bladder offering little resistance to the largest part of the instrument, which is the bulb made by the closed beaks. Once in the bladder the blades are made to open, when by well directed manipulation the calculus may be seized in some one of its diameters; and by a force imparted through the agency of a screw in the handle or external part of the instrument, the calculus is crushed, or reduced in size by a grinding and sliding of the closing blades. It should be mentioned that a catheter is to be introduced into the bladder and from four to six ounces of water injected, if that amount of urine be not present, previous to the use of the lithotrite. The fluid facilitates the movements of the lithotrite, and lessens the danger of injuring the walls of the bladder. It is well to introduce an opium suppository or an enema of laudanum into the rectum a few hours before the lithotrite is employed. It is not generally desirable to use the lithotrite while the patient is under chloroform, lest some injury be done to parts, without the patient indicating that he is being hurt. It is presumed of course, that a sound has been employed to detect the presence of stone before an attempt of any kind is made to remove a calculus.

FIG. 177.



Lithotrite.

A patient about to undergo the manipulations of a lithotrite should have the bowels well emptied, and enjoy a day or two of rest on a light diet, to render the prostate and bladder as little irritable as possible: and while the manipulation is going on he should recline upon a sofa, and have his pelvis a little raised.

A lithotrite should be moved in the bladder as little as possible, but when the blades have been opened they are rocked a little by the side of the calculus, to afford the stone an opportunity to roll between the jaws that are ready to grasp it. In some instances many unsuccessful attempts may be made before a calculus can be seized. Generally it is best to depress the lower and fixed blade of the instrument, so it shall occupy a lower level in the bottom of the bladder than the calculus. This favors the rolling of the stone into the open jaws of the lithotrite.

Before an attempt is made to grasp the stone after the lithotrite has entered the bladder, it must be ascertained by a sliding movement of the instrument, on which side of the calculus the blades are resting. Then, while the blades are opened, they are to be kept away from the stone, so that when well apart they may the more readily receive the calculus as the blades are pressed towards the oval object to be grasped. It is well for a novice in lithotrity to practice the seizure of a pebble which is carried in a side coat-pocket, and every time the stone is grasped the instrument is to be brought into view that the peculiar grip may be observed. It would be purely accidental if an inexperienced manipulator of a lithotrite should grip a calculus the first time trying; and the bladder is not so good as the pocket to learn the art of grasping a stone systematically, for a defect of method can not be corrected unless experiments be conducted where they can be observed. A scale on the sliding rod of the lithotrite indicates the distance between the blades when they are opened. After grasping the calculus the turns of the screw which are to apply the crushing force should be carefully made in order to avoid rocking or moving the instrument.

At the first trial the operator is to abandon his manipulations as soon as he has broken the stone once, especially if the bladder be irritable. If much distress be inflicted at the first trial, the patient looks forward to a repetition with dread. It is well to use an opium suppository in the rectum directly after each manipulation with the lithotrite in order to allay the pain and to prevent undue irritability of the bladder. Every time a lithotrite is withdrawn care should be exercised that the blades be perfectly closed. An attempt to remove them partly open might result in irreparable injury to the neck of the bladder, prostate, and urethra. Ten or fifteen minutes may be consumed at each manipulation; and the operation is not to be repeated as long as the patient passes fragments, or detritus, with the urine. Often a week will intervene between trials.

A serious complication in lithotrity is a rigor which is apt to follow even a well conducted manipulation, therefore it is a useful precautionary measure to administer chloroform to the patient as soon as the lithotrite is withdrawn, or while withdrawing the instrument; and a dose of chloral hydrate may be given while the effects of the chloroform are passing off, in order to prolong the anodyne influence. Hot applications to the feet, and an abundance of bed covers, tend to prevent the rigor.

Two or three trials with the lithotrite may suffice to get rid of a small stone, especially if the patient be able to pass quite large fragments *per urethram* in efforts at micturition. As high as fifteen or twenty trials have been made before a large calculus was sufficiently reduced to escape by the urethra.

A scoop-lithotrite has been invented for removing fragments of a calculus that refused to come away with the urine; but it is an instrument that should be employed with caution, inasmuch as damage to the neck of the bladder has frequently attended its use.

LITHOTOMY.

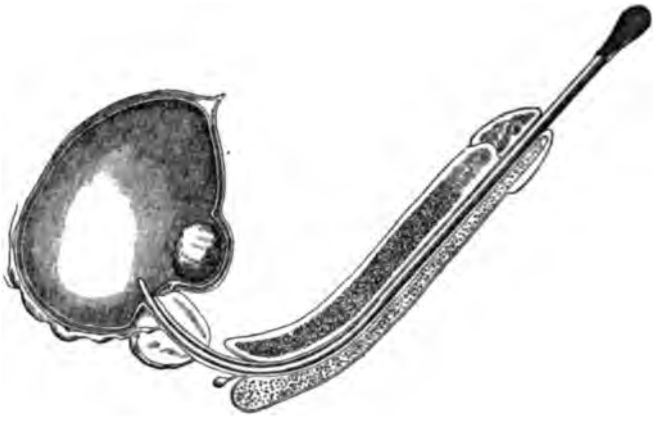
Hippocrates entertained such a horror of wounding the bladder, that he made his pupils take an oath never to perform lithotomy. However, the operation has been carried to a degree of perfection in modorn times, which places it among the most legitimate of surgical performances.

The history of attempts to remove vesical calculi, is curiously interesting as exhibiting the progress made in a single branch of chirurgical science. At one period, lithotrity, or crushing the stone in the bladder, so the fragments might come away piecemeal, or as detritus, was in high repute; and, at another, there were influential advocates of "solution," which was to be effected by throwing such fluids into the bladder as might dissolve calculous formations. While "solvents" will continue to be employed by the timid and incompetent; and lithotrity never fail to have champions, the extraction of vesical calculi through a perineal incision will be the leading operation of the future, as it is of the present. Lithotomy quickly and radically relieves the patient; lithotrity requires frequent experimental operations, or sittings and trials, which are tedious and painful, and not without danger. In many instances, lithotrity is wholly impracticable.

The first step in lithotomy is to ascertain positively whether or not a stone exists in the bladder. The information is gained chiefly by "sounding," the ordinary symptoms of vesical calculus not being sufficiently decisive to warrant a cutting operation. The subjective or rational symptoms of stone, which lead to the application of tests through mechanical means, consist of pain or unusual sensitiveness in the region of the bladder, perineum, or hypogastrium. Often the pain is paroxysmal, occurring about the time of micturition, but more especially at the termination of the act. In children the irritation is so great at the end of the penis that they endeavor to allay it by drawing the penis and prepuce forward, which gives rise to an elongated appearance of the foreskin. The prepuce becomes sodden with urine, as well as the fingers of the patient, causing them to emit a urinous smell. The pain is aggravated by walking, jumping, and active exercise; and its intensity increases with the advance of the disease.

The pain is not uncommonly severe in the glans penis, testicle, perineum, back and thighs. During the flow of urine there may be sudden stoppages, but for a moment only, the stream soon re-appearing. Retention and incontinence of urine are frequent complications. Priapism and seminal losses, hæmaturia, tenesmus, and prolapse of the rectum, are enumerated among the subjective symptoms of vesical calculus.

FIG. 178.



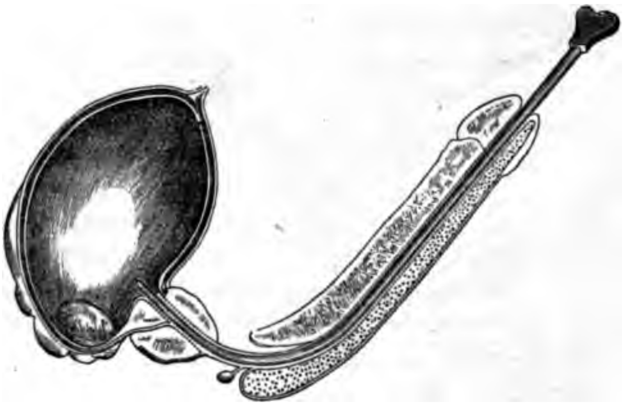
Calculus too high to be reached with the sound.

The physical signs of stone in the bladder are to be developed by artificial or mechanical aid, giving to the senses of touch and hearing distinct evidence of a foreign body in the vesical cavity. The instrument, called a "sound," is solid steel, similar to a catheter in size and form; and the process of introducing this through the urethra, and manipulating it in the bladder until the stone be audibly and palpably struck, is called "sounding."

The attitude of the patient while being sounded should be the recumbent one; but the standing posture may be tried in obscure cases. The rectum ought to be empty, and the bladder moderately distended, to facilitate every part of the manœuvre. Such manipulation should be practised as would bring the point of the instrument in contact with every part of the bladder.

Pressure of the hand above the pubes may dislodge a calculus which rests in a pocket above the prostate; and the finger introduced into the rectum may be made to elevate a calculus, so that the sound may strike it.

FIG. 179.



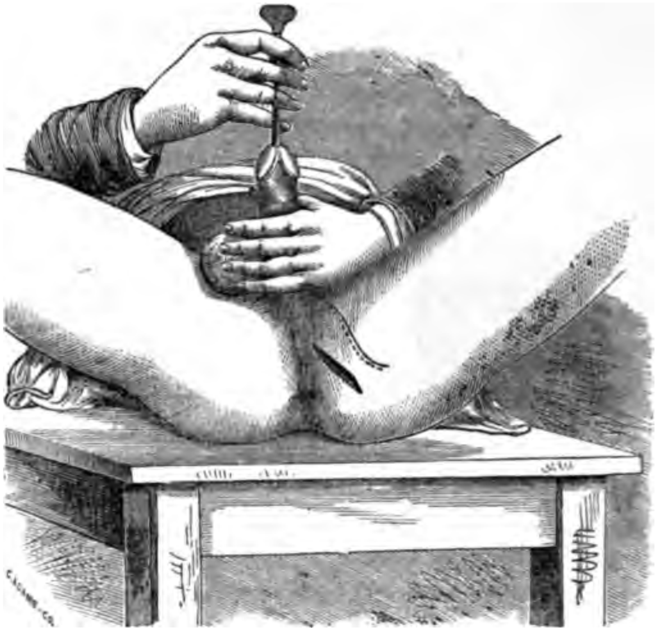
Calculus depressed too much to be reached with the sound.

Small calculi commonly rest in the floor of the bladder, inclining to one side or the other; a large stone gets near the neck of the bladder, and sinks into the base of the organ.

By the aid of the sound the surgeon not only detects the presence of calculi, but is assisted in determining the size, situation, number and density of the calculous formations. The light, friable phosphates, when struck, emit a dull and scarcely appreciable sound; smooth and dense calculi, composed mostly of lithic acid and oxalate of lime, yield a clear, ringing, sonorous sound.

It is sometimes extremely difficult, if not absolutely impossible, to detect a stone in the bladder by sounding. The difficulties enumerated are, a large, deformed, sacculated, irregularly contracted, and disorganized bladder, with calcareous walls; also, calculi in the urethra and prostate, and tumors, strictures, and fistulæ. However, the operation of lithotomy is not to be performed until the presence of stone be positively determined by sounding. The most experienced surgeons have committed the blunder of cutting for stone when there was none in the bladder, yet this mistake is to be avoided if possible.

FIG. 180.



This diagram represents one hand of assistant supporting the staff, and the other the genitals. The dotted line represents the relation of the internal pudic artery to the rami (curved line) of the pubis and ischium. The cut is made about half way between the anus and the dotted line.

A patient about to undergo a lithotomy operation should be in as good condition as practicable. The rectum should be empty, and the bladder pretty well distended. A few hours previous to the operation the bowels might be evacuated with a mild cathartic, or by the aid of a syringe; the patient may be instructed to retain his urine until the bladder is moderately full, or injections of tepid water through a catheter, after chloroform has been administered, will do as well.

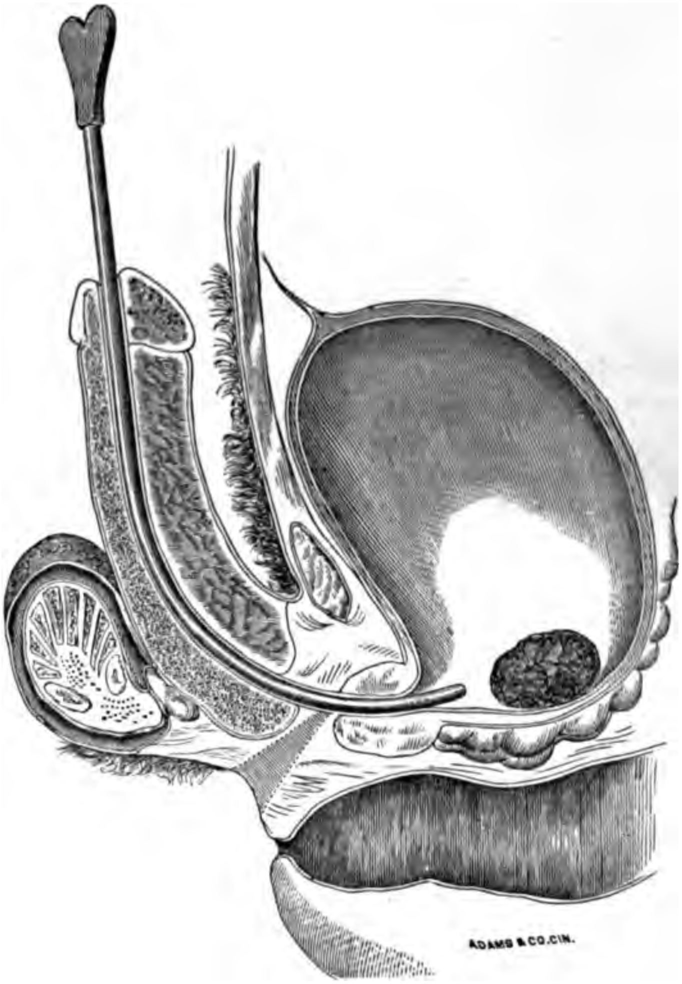
The patient, supported by pillows beneath his head and shoulders, should rest upon a table of convenient height for the operator, who sits upon a stool. The buttocks of the patient should be even with the edge of the table; and his legs should be fixed and spread, so that the feet and hands may be tied together, or held in that position by assistants.

The requisite instruments are to be placed conveniently to the operator; and will be named as they are introduced in the course of the operation. Everything being in readiness, chloroform should be administered to the patient; then the surgeon introduces the staff, which is a grooved instrument, and serves the purpose of guiding the knife along its channel, as the common grooved director of the pocket-case guides the bistoury while ordinary incisions are made. The staff should be carried gently into the bladder, and its end be made to rest against the stone if practicable. It is then to be entrusted to an assistant, who holds the instrument in the vertical direction, and closely against the pubic arch. The holding of the staff properly is an important part of the assistance, therefore the surgeon should see that this duty is well executed. The staff should be so held that its position shall correspond to the natural curve of the urethra; and not alter the normal relation of the structures. If the convex part of the instrument be allowed to drop down toward the anus, the rectum would become exposed to the knife while making the perineal incision.

The first cut is to be made through the skin, fat and superficial fascia with a common scalpel, the incision beginning in the median aspect of the perineum, a little to the left of the raphe, an inch or more above the anus, and, in its course downwards and *outwards* to the extent of two or three inches, may terminate between the anus and the tuberosity of the ischium, a little the nearest to the latter point. This incision is not made deep enough to endanger the rectum, nor the internal pudic artery, which holds its course close to the ramus of the ischium. This is what is called the *lateral operation*, which is now generally performed by the most experienced surgeons in preference to the "bilateral," which severs the median line of the perineum and extends obliquely down into both ischio-rectal fossæ. What is called the "median" cut is now rarely performed by any surgeon.

The primitive incision just described does not divide important vessels, therefore no hemorrhage need be feared. A few applications of the wet sponge will check whatever flow there may be. Now, to avoid cutting the walls of the rectum, the bulb of the penis, or any deep seated arteries, the forefinger of the right hand may be forced from the bottom of the primary incision to the membranous portion of the urethra. No great force is required to lacerate the fascias and other soft structures on the way. The groove in the staff is easily felt through the walls of the urethra; and the finger and its nail serve to guide the point of the bistoury to the spot where it is made to puncture and incise the intervening tissues, or, as yet undivided

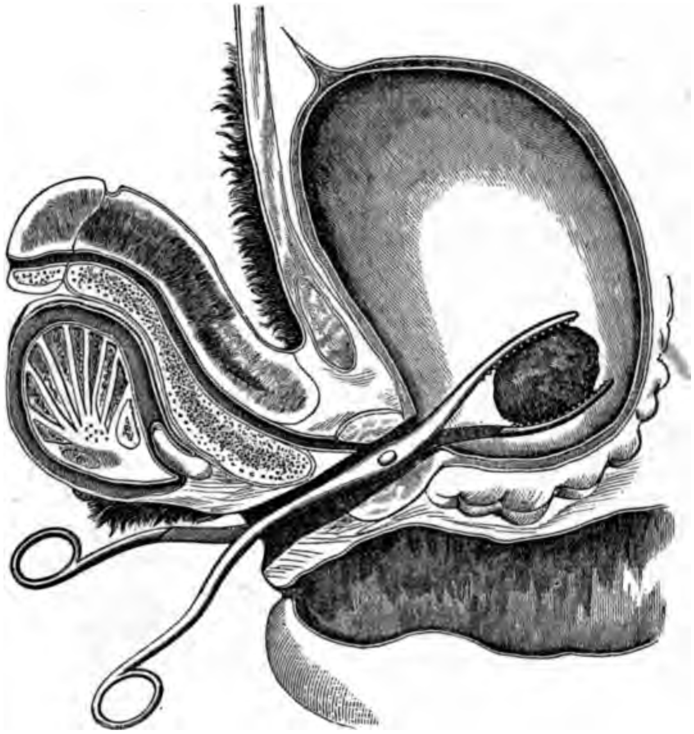
Fig. 181.



The dotted lines reaching from the perineum to the staff, represent the course of the perineal section, so as to escape the bulb of the penis, and strike the urethra in its membranous portion.

structures, thus completing the cut from the skin to the staff. A knife with a beak in advance of its point, is to be introduced through the incision, until the beaded protuberance or projection rests in the groove of the staff; then the assistant surrenders the instrument to the surgeon. who steadies it with his left hand, and carries the beaked knife along the groove into the bladder. A long, straight, sharp-pointed bistoury is just as good as the beaked knife; though a little more care is required to keep the point in the bottom of the groove in the staff. The cutting instrument should be so inclined laterally as to incise the prostatic portion of the urethra—not along its bottom or floor, but through the left lateral wall. This saves intact the veru montanum, sinus pocularis, and mouths of the ejaculatory ducts.

FIG. 182.



The calculus grasped by the forceps and ready to be extracted through the perineal incision.

As soon as the knife enters the bladder a gush of urine takes place. The staff may now be withdrawn and laid aside; the forefinger of the left hand is to be carried along the back of the knife till it reaches the cavity of the bladder, where it will probably come in contact with the stone; and if the calculus be very small, the knife may be withdrawn, and the forceps introduced to extract the pebble. But if the stone be an inch or more in diameter, the finger is to be pressed against the back of the knife to enlarge the wound in the prostate and neck of the bladder. In no instance, unless the calculus be very large, is the incision to extend clear through the substance of the prostate. It is better to turn the edge of the knife against the right lobe of the gland, and enlarge the wound by incising it. If the prostate be cut entirely through, there is danger of urinary infiltration, phlebitis, and other unpleasant complications. It is safer to stretch and bruise the tissues during the extraction of the stone, than to incise the entire substance of the prostate. Some surgeons prefer to enlarge the wound, after the finger is introduced into the bladder, by tearing the friable prostate, and other easily lacerated tissues. There is force enough in the finger to enlarge the opening to the requisite extent; and a rent in that region is less dangerous than a cut.

The next and last step in the operation consists in carrying the forceps through the wound, grasping the stone and extracting it. The forceps are closed as they enter the bladder, and are thus used to find the stone. Then, while the blades are in contact with the calculus, the operator manages by adroit manipulation to grasp the stone by its smallest diameter. After the seizure is made, the finger should be introduced, if possible, to determine by feeling whether or not the grasp of the forceps is perfect, or to adjust and correct an imperfect grip. It is unfortunate, while extracting the stone, to have the forceps let go; or to be obliged to re-seize the calculus. After the stone is well grasped the extraction is to be performed slowly and deliberately, the forceps being moved in the direction of the axis of the pelvis, and so wriggled up and down and to each side, as to facilitate delivery. Too much force applied to the handles of the forceps may break the stone into fragments; and then the pieces have to be removed as best they can be,—sometimes with a scoop, an instrument that belongs to a lithotomy set.

After the stone has been extracted, the bladder should be carefully examined for any other urinary concretion; and it is well to use a syringe for the purpose of washing out the detritus of the operation, whether it be in clots or gritty particles ground off by the teeth of the forceps.

The operation having been successfully completed, the patient is removed from the table, and placed upon a bed which has been prepared for his reception. A rubber cloth should be placed under the sheet in the region of the bed the pelvis is to occupy; and old cloths, as absorbents of the urine, ought to be in abundance. The excoriation of the nates, produced by the contact of acrid urine, is the most distressing part of the recovery.

No catheter in the penis, nor tube in the wound, need be used, but the urine should be allowed to escape without assistance or hindrance. A part may pass through the penis from the first, yet the opening through the perineum is likely to give passage to the most of it. The swelling on the second and third days may so block up the artificial opening, that the urine may be voided through the urethra for a while, yet as the tumefaction subsides, the flow will return to the perineal passage-way. On the fourteenth day, in an adult, the wound will have so far granulated or healed, that normal micturition will be re-established, and the patient may then be pronounced substantially well. The diet of the patient, and the nursing, should be such as an important surgical case usually demands. The bowels need not be moved for a day or two after the operation; and then by the assistance of an enema or laxative. Anodynes may be administered in the event of great pain; and arterial sedatives in febrile complications. The sufferings of the patient during the period of convalescence are commonly not intense. The first attempts at urination are somewhat painful.

Difficulties and Dangers of Lithotomy.—It was thought best to describe the operation of lithotomy in a plain and practical manner, and not interrupt the recital by recounting obstacles, accidents and dangers.

In extreme youth and age there are a few considerations which demand attention. A child needs a sound and staff appropriate to the size of its urethra; and great care must be exercised in the introduction of the instrument lest a false passage be produced. As the stone is not extremely large, the lateral perineal cut will allow the stone to be extracted without serious damage to the pelvic viscera. Incontinence of urine follows lithotomy in children more frequently than it does in adults, though the disparity is not marked.

An old man, harassed for years with calculous complaints, and enfeebled in many ways from various causes, is not a favorable subject to lithotomize. However, an increase of risk on account of age, should not deter the surgeon from a humane purpose. The object of lithotomy being to better the condition of the patient, the young, and the old, and the feeble, when suffering from stone, ought not, though the peril be greater, to be deprived of the benefits of an operation which has proven to be comparatively safe in the better class of subjects; and the skill of the operator is not to be judged wholly by the percentage of success or failure in a given number of cases. A half dozen unusually bad subjects may be presented in succession; or, as many uncommonly good ones may come along together, to plague or praise the operator.

As already announced, there is a little bother sometimes while attempting to incise the urethra and to introduce the probe of the lithotome through the cut and into the groove of the staff. The finger is the guide for the knife, yet its pulp or feeling surface being engaged in maintaining its proper relations with the staff, its nail has to be the director for the point of the instrument, and is, therefore, not a little uncertain. An instrument with a forked extremity, to bestride the uncut urethra and enclosed staff, to guide the knife to the point of the urethra needing incision, would prove a valuable addition to a lithotomy set of instruments.

A stone too large for extraction through an ordinary lateral cut, is an obstacle to be considered. If very great force be used in attempts at delivery, the parieties of the opening may be bruised to an extent which is followed by a dangerous or fatal sloughing; and too free incision, to make way for the passage of the stone, is attended with peril. A stone which measures an inch in diameter, is moderate in size, and may be easily extracted; but a calculus whose smallest diameter is an inch and a half, may be considered quite large, and difficult, if not dangerous, to extract.

It may be natural for an unprofessional person, when examining a calculus of considerable proportions, to ask what the stone will *weigh*; but the lithotomist is more exercised about the size and shape of the concretion. The uric acid calculus is very compact and heavy, and emits a ringing sound when struck; while the triple phosphate is remarkably light and fragile, not having the density and cohesion of common chalk.

It is regarded as a misfortune to break or crumble a calculus in the process of extraction,—lithotrity being performed without intending it. However, if a stone be too large for extraction, its size must be reduced by the use of grinding or crushing instruments. A stone five or six inches in diameter could not be removed until it had been broken into fragments. Fortunately, very large calculi are rare.

It is not extremely uncommon for the bladder to contain several stones of moderate size. As many as one or two hundred small calculi have been extracted in a lithotomy operation. The multiple character of the concretions does not necessarily increase the danger, but it makes the extraction a little more tedious.

Foreign bodies of various kinds may demand removal from the bladder through a perineal section. A piece of broken catheter may get into the bladder and become encrusted with urinary salts, so that it is practically a stone that has to be removed by a lithotomy operation. I once removed a fragment of pitchfork tine from the bladder of a young man who had carried it nine months, or until the piece of polished steel was nearly buried in calculous encrustations. The young farmer was thrown from a load of hay, and his three tined pitchfork went in advance, so that as the handle struck the ground he received the points of two of the tines in his nates: one prong hit the tuberosity of the ischium, and broke into three fragments; the other made a flesh wound and did no other harm. One of the fragments of the broken tine passed through the obturator foramen and lodged in the rectum;—afterwards it was discharged *per anum;* a second fragment is presumed to be in the gluteal region, though it has never created any disturbance or otherwise made its presence known. The third piece, two inches long, lodged in the base of the bladder, just in front of the vesical openings of the ureters, its two rough ends becoming embedded in the parieties of the organ, and were not covered with encrustations. The foreign body provoked profuse hæmaturia, and created much uneasiness and pain. Ordinary lithotomy was performed, and the source of trouble removed. No unfavorable symptom followed the operation; and the patient made a perfect recovery in every respect.

A serious complication attendant upon lithotomy is cellulitis and phlebitis in the prostatic region. The difficulty is presumed to arise from urinary infiltration, though it may come from bruising and lacerating the tissues enveloping the prostate and vesiculæ seminales. A careless, blundering, and rough operator, may do such mischief to deep parts as to favor dangerous grades of inflammation. Even a discreet surgeon may have serious sloughing and disorganization follow the extraction of a stone two inches in diameter. A patient may undergo the removal of a calculus one inch in diameter with comparatively little risk; yet his life would be placed in extreme peril if the stone had a diameter of two or three inches.

Hemorrhage is one of the greater dangers of lithotomy, yet the less the cutting, and the more the finger is used to lacerate, in making a passage to the urethra, the smaller the quantity of blood likely to be lost. Then again, after the knife has entered the bladder, excising the urethra on the way, the finger may be employed to enlarge the passage, tearing the prostate and the neck of the bladder, to save undue losses of blood. A wound enlarged by the pressure of the finger is not disposed to bleed. The directions I have already given to avoid cutting the internal pudic artery will suffice to avoid arterial hemorrhage. The superficial artery of the perineum is sure to be divided, yet the hemorrhage from it must be unimportant. If a poor anatomist and a reckless operator should cut all about in the deep perineum, he would be likely to let loose a profusion of blood, yet if a few simple rules be followed to avoid hemorrhage, no considerable losses of blood need be expected. Troublesome capillary oozing and venous hemorrhage might be arrested by injecting the wound with astringents, and by the internal use of turpentine and other reputed styptics. Very rare, indeed, must be the necessity for using ligatures or tampons.

Cutting the rectum, establishing a recto-vesical fistula, is an accident enumerated among those incident to lithotomy. In the event of such a complication, the surgeon should, after it was seen that the false passage was inclined to be permanent, cauterize the fistulous track, and, if need be, perform a new and suitable operation for the closure of the opening.

A perineal fistula, left by the healing of the passage made to extract the stone, is another complication following lithotomy. The fistulous canal may be managed much as in an ordinary perineal fistula, caused by stricture of the urethra and urinary infiltration. The fistulous track must be *freshened*, and its walls approximated and held in contact with deeply-passed silver sutures. In the freshening process, care should be exercised that the very beginning of the pipe in the urethra be made fresh, lest a new fistula form. A silver or leaden catheter should be kept in the urethra and bladder, to prevent urine from reaching the healing track.

Incontinence of urine in young subjects, and seminal losses in adults, are enumerated as among the contingencies of lithotomy, though not frequent complications. There is no particular treatment for such conditions beyond that employed in the management of like difficulties arising from ordinary causes. The restorative forces so apparent in correcting other defects, will commonly remedy them.

Renal disease of a serious character, induced or aggravated by the vesical trouble, may prove an obstacle to recovery after lithotomy. It is well known by every practitioner of medicine and surgery that a marked sympathy exists between the renal and pelvic organs; and it is not therefore unexpected to observe nephritic affections as acute or chronic complications following the removal of vesical calculi. There is reason to believe, indeed, that the primary disorder leading to the formation of stone in the bladder, is to be referred to the kidneys. And it would not be unreasonable to suppose that an organic disease of the kidneys might be forced into activity by so impressive an operation as the extraction of a vesical calculus. Disease of the bladder has been aggravated by the removal of concretions which have long proved a source of vesical irritation. Notwithstanding the danger of occasionally hastening a fatal issue, the lithotomist is not to abandon his purpose to operate through apprehensions of unfavorable results. In many instances the removal of a calculus from the bladder will be followed by a cure of the renal and vesical troubles. Probably a beneficial influence will be observed in more cases than harm can be proved to arise from the operation. It is a maxim in pathology, when several difficulties exist at the same time, that the removal of one ought to be followed by beneficial influences upon the remainder.

Urethral and prostatic calculi existing at the same time with stone in the bladder, render lithotomy both difficult and dangerous. A concretion the size of a pea just within the meatus urinarius, obstructs the passage of sounds, therefore the glans should be incised upon the upper aspect, from the meatus back a half inch or so, to facilitate the dislodgment of the urethral calculus. After this part of the preliminary operation has been successfully accomplished, the major operation may be entered upon as if it had not been complicated by the presence of a calculus in the fossa navicularis.

A stone which has formed or lodged in the prostatic portion of the urethra, and not unfrequently called prostatic calculus, is a grave complication which has to be met and overcome before a vesical calculus can be removed. The concretion may lodge in the membranous portion of the urethra, in front of the prostate. Located in either of these places, the calculus forms an obstruction to the passage of a sound or staff; and the surgeon has to exercise care in the introduction of instruments lest he tear the walls of the urethra in the vicinity of the stone. To remove the difficulty, *i. e.*, to extract the prostatic calculus successfully, a staff is to be carried as far as the stone, where its end serves as a guide in making the perineal section. The instrument having been reached, the calculus forms a firm support to cut upon, especially if it be steadied by a finger in the rectum. Enough of the membranous portion of the urethra and the prostate being incised to allow of the seizure of the calculus, the stone may be removed with forceps adapted to the purpose. A staff may now be introduced into the bladder, and, if a vesical calculus exist, it may be extracted in the ordinary manner, after the prostate and neck of the bladder have been incised or lacerated sufficiently to permit the stone to pass out.

The recurrence of stone in the bladder after lithotomy is a subject which interests the patient as well as the surgeon. Guy's Hospital Reports show that relapse after several months or years is not extremely uncommon. About one case in forty requires a repetition of the operation; and in those cases demanding second and third operations, the cut was made in the line of the original incision, and the results were satisfactory.

The Hypogastric or High Operation.—A vertical incision in the median line just above the pubes, cutting through the linea alba, deep fascia, and cellular tissue, brings the operator to the summit of the bladder, a region the viscus is previously made to reach by injections of tepid water, or accumulations of urine. Thus reached, the bladder is to be seized with toothed forceps, and incised with a bistoury to an extent which will admit the forefinger. The opening may next be enlarged by laceration or with the knife, until it be large enough to allow of a ready extraction of the stone. In old subjects, whose bladders sink low into the pelvic cavity, there is danger of wounding the peritoneum, unless the operator keeps close to the symphysis; and the supra-pubic operation is likely to be attended with infiltration of urine and the dangers consequent upon that complication. While it is an operation which may be legitimately resorted to when the great size of the stone or a deformity of the pelvis seem to necessitate or favor this method, in ordinary cases it has never been considered so safe as lateral perineal lithotomy. When the hypogastric operation is performed, the patient should not be disturbed during the healing process. The presence of lint in the wound or of a catheter in the urethra, is more mischievous than beneficial.

ORGANIC STRICTURE OF THE URETHRA.

The urethra of the male is often lacerated by injuries of an accidental nature. In the perineal region the urethra is exposed to the force of falls astride firm resisting bodies, as the top rail of a fence, the back of a chair, the edge of a board, the tire of a wheel, etc. Parts of the urethra, enveloped by the penis and the prostate gland, are rarely injured, but the membranous portion is subjected to bruising and lacerating forces. I once took charge of a negro boy who had his urethra severed or cut across by a fall upon a sharp point of fence paling.

The immediate signs of lacerated urethra caused by an injury, are a contused state of the perineum, a disposition to urinate frequently, discharge of blood from the urethra, and nervous shock. In some instances no urine can be voided from the first, and in the majority of cases the ability to empty the bladder is lost as soon as inflammation sets in.

If the patient be unable to urinate, the surgeon should try to assist the sufferer in his endeavors to evacuate the bladder. A hot plate applied to the epigastrium and heat to the perineum, often restore the power to urinate. The inhalation of chloroform to a moderate extent will subdue the pain, and thus assist the patient in his efforts at micturition. After these means fail, as they often will, a flexible catheter, without the stiletto, is to be employed with great caution and gentleness. If this can not be passed, a silver catheter should be tried, its point being gently pressed against the superior wall of the urethra while passing the injured region.

In the event that the catheter can be passed into the bladder, the question arises in the mind of the surgeon, whether the instrument is to be left in its place for some days or withdrawn at once. The course to pursue at this juncture depends upon circumstances. In bad cases, and they are nearly all such, the catheter should be retained in the bladder for ten or fifteen days, for, if taken out sooner, it can not generally be re-inserted. If the bruising of the perineal structures be considerable, and the sanguineous and urinary infiltration great, sloughs and fistulæ being threatened, it is best to incise the perineal structures covering or enveloping the catheter, at once. This incision allows of free discharges, and does not necessarily prolong the period of cure. The perineal incision prevents many of those perplexing and dangerous complications which render the treatment of a lacerated urethra so unsatisfactory.

If at the reception of the injury, the urethra be cut or torn entirely across, the management of the case is attended with formidable obstacles. The divided ends of the urethra do not remain in contact, but are retracted in opposite directions, and deflected by muscular forces and other influences. A complete transverse division of the urethra is determined by the nature of the substance producing the injury. If a penetrating instrument has incised the perineum along its middle course to the depth of the urethra, it is almost certain that the walls of that canal have been divided. The inability to pass a catheter beyond the point of injury leads to the same conclusion. The structures of the perineum are so loose that it is easy for an inexperienced person to deceive himself in regard to the passing of the catheter after it has left the urethra at the point of division. The instrument can be readily carried along in the proper direction, yet be outside the urethral walls. Of course it would fail to enter the bladder; and only then would the operator learn his mistake. It is possible that the surgeon may, by dilating or extending the perineal wound, seize the distal end of the urethra with forceps, and so hold it as to admit the end of the catheter, but in most instances the attempt to grasp the retracted end of the urethra would fail. If the trial be futile, there seems no better way than to leave the wound to itself. The urine will mostly escape through the perineal opening, which in time will degenerate into a fistulous passage. This at length may be treated as ordinary stricture complicated with perineal fistula is managed, though a favorable result is not promising from the fact that the artificial passage for some distance has no urethral texture in it. The daily use of bougies, to say nothing of other contingents, seems to be entailed upon such cases.

If the urethra be torn completely across, without an opening being made in the perineum, an incision should be established to allow the escape of blood and urine. The condition then becomes like that just described. Delay in opening the perineum with the knife aggravates the local mischief, and endangers the life of the patient from infiltration of urine.

If incising the perineum as deep as the divided urethra is not followed by a discharge of urine, and the patient's life be in peril from retention, as a *dernier resort* the bladder must be tapped through the rectum, a long and curved trocar and canula being used.

Laceration of the urethra, whether properly treated at the beginning or not, is liable to result in calloused or indurated stricture, more or less impermeable, the patient being annoyed by inability to urinate freely and at the usual intervals. The stream is altered in form, becoming flattened, twisted, forked, and lessened in momentum. Laborious and unavailing efforts at micturition bring on tenesmus of the rectum and prolapsus. A ridge of induration can be felt at the seat of stricture, and more or less tenderness exists at that point. The urine being retained too long in the bladder, decomposes, giving off strong ammoniacal odors, and deposits clouds of mucus and pus. From vascular turgescence in the mucous coats of the bladder, and of the urethra in the vicinity of the stricture, a show of blood is often produced. An incontinent dribbling excoriates the scrotum and thighs, and gives the patient an offensive urinous odor. The irritative fever disorders the digestive organs, causing wasting of flesh and general prostration. Not unfrequently the patient has to attend almost constantly to efforts at urination. In some cases the urine dribbles away, all coming through the urethra, and in others, where perineal fistulæ exist, a part of the urinary fluid escapes by these false outlets.

It may be remarked, in this connection, that what are called "organic strictures," caused by cicatrization following chancrous or other ulcers, are practically the same as those of a strictly traumatic nature. In all cases of ulcerated or lacerated urethra, a loss of substance, or a resulting cicatrix, permanently contracts and distorts the parts involved. The location of traumatic stricture is, of course, where the injury was received, and that, as already indicated, is usually along the membranous portion of the urethra, or of the spongy part near the juncture of the membranous portion. The prostatic division of the urethra rarely, if ever, becomes involved in the injury, therefore it escapes stricture. Sometimes the obstacle is a mere ring of constricting material, and in other instances an inch or more of the urethra is involved in the organic distortion.

The degree or extent of the obstruction ranges from the slightest appreciable constriction, to so near obliteration that the smallest instrument can not be made to pass the narrowed and distorted part of the urinary canal, the only evidence of permeability consisting in the fact that a dribbling of urine is kept up.

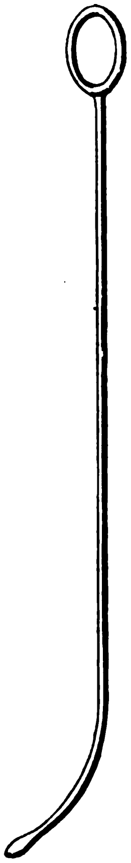
In an ordinary stricture of the urethra the common English and French bougies may be used to dilate the passage at the narrowest point. Every physician's office contains a variety of these instruments; and they have been used on multiple occasions, therefore I shall pass over this part of the subject, and enter upon that which is more intricate or complicated.

Innumerable instruments have been devised to overcome strictures, the inventors having in view dilatation of contracted parts, and of course permeability of the constricted track. I shall merely mention filliform bougies made of whale-bone, horse-hair, cat-gut, and other materials which are somewhat stiff, yet flexible, and consequently designed to pass in a canal reduced to the size of a pin, and to permeate the tortuous course of a strictured urethra. These instruments are intended for only bad cases, and in such they are not often of much service.

Urethral instruments have been devised to permeate "organic strictures" and then cut, tear, and dilate them. These contrivances are intended for the *internal* division or laceration of strictures. Holt's apparatus is one of this kind, and is for sale by every surgical cutler. "It consists of two grooved blades fixed in a divided handle, and containing between them a wire welded to their points, and on this wire a tube (which when introduced between the blades corresponds to the natural calibre of the urethra) is quickly passed, and thus ruptures or splits the obstruction." This piece of mechanism and another of similar action, modified by Mr. Henry Thompson, constitute the best *rupturing* implements yet invented, where the permeability of the stricture will admit the passage of the points of the instruments. But that is frequently not an easy matter. The points are small, and of a shape favorable to making "false passages." If the indurated track be long and tortuous, the instruments could not be made to follow the course of the sinuosities.

The most skillfully contrived instrument for entering the track of a stricture is that of Maisonneuve. The entering end of the instrument has a point the size and shape of a flax-seed, and a staff the size of a knitting needle, so curved as to conform to the route to be traversed. If any instrument can be made to pass a stricture or enter a strictured track, it is seemingly this. A modified form of the permeator is represented in the diagram. It is shorter than that of Maisonneuve, and has a ring on its outer extremity to let the manipulator know where the point is, and to assist him in controlling the entering end of the permeator. After this has been worked through a stricture, it is generally easy enough to pass the one which serves to guide the splitter or dilator. Having once passed the stricture, a spindle shaped dilator having a perforation in its longest diameter, is slid upon the staff or guide, till it reaches the obstruction, and then, by a screw attachment is forced through the stricture, rupturing it.

FIG. 183.



Urethral permeator.

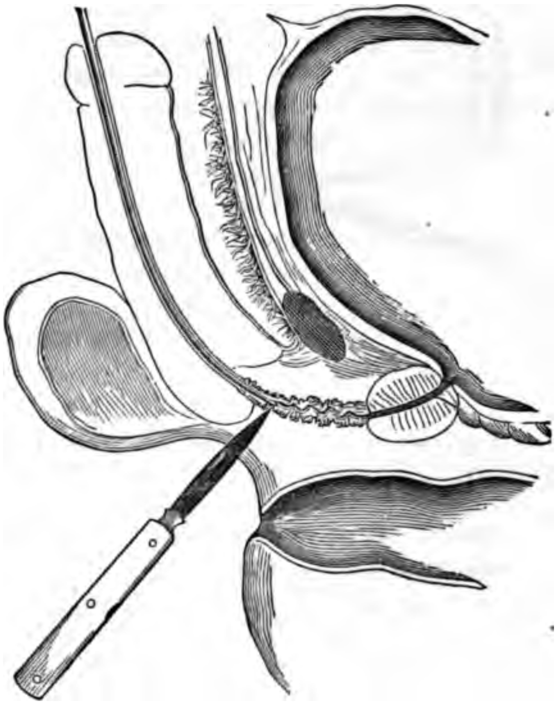
The bulbed end of the guide may be unscrewed, and a filliform permeator fastened in its place. This very slender and flexible *leader* is intended to enter and pass very narrow and tortuous tracks, where the bulb could not be made to go, but the flexibility of the attachment is so great, that the manipulator can not tell whether the filliform is advancing or coiling into a knot, therefore it is not of much value, unless in dexterous hands.

Maisonneuve has devised a lancet-like incisor to be slid down on the guide or conductor until it passes the stricture, then it is to be withdrawn, the cutting edge being so arranged as to incise the morbid mass on its return. After the incision has been made it is easy to use the dilator already mentioned. Of course the stricture must be permeable to the guide or director, else the incisor can not be employed.

From what has been said it may be inferred that there are strictures which are impervious to any kind of instrument. Such a one was recently under my treatment. Mr. Saum, of Van Wert, Ohio, two years or more ago, slipped while alighting from a load of hoop-poles, and fell astride the fore wheel of his wagon, and thus received a severe contusion in the perineum. At first the pain was severe, but soon he was able to walk some distance to his home. A desire to urinate was teasing, yet he could not pass much fluid at each effort, and that was chiefly blood. The physician first called to him used a catheter, and evacuated the bladder. The instrument was not re-introduced, and the patient managed to discharge the urine by frequent efforts at micturition. Probably it would have been better if the medical attendant had left the catheter in the urethra. In the course of a few weeks the inflammation caused by the injury subsided, but it was evident that a troublesome stricture was to be permanent. Repeated efforts were made from time to time, by different surgeons, to pass catheters, sounds and bougies, but no one succeeded in forcing an instrument beyond the first stricture which was in the spongy part of the urethra near the membranous division. The morbid masses beyond were too contracted and tortuous to allow of deeper penetration.

In attempting to pass the Maisonneuve explorer, I spent an hour or more in gentle and persevering manipulation, yet could not get beyond the first stricture. I then resolved to divide the strictures by a "perineal section." As the bulb of Maisonneuve's permeator had already passed the first stricture, I cut for it through the middle line of the perineum, along the raphe, and easily reached the object of search, incising the urethra to an extent that would admit the end of a common grooved director of the pocket case. This instrument was now to be the guide for incising the morbid masses which reached for an inch or more, or to, if not into, the prostate. I did not incise the perineum very freely, but manipulated my instruments in as small an opening as practicable. It is perhaps needless to say that the progress of penetrating the strictures with the grooved director, and dividing them with the point of a knife, was tedious. Sometimes it was exceedingly difficult to keep the point of the director in the track of the urethra, yet as this was essential to success, the struggles of the patient, who could hardly be quieted with chloroform, did not force me to relinquish efforts to maintain the instrument in the right place. At length I got the director past all the indurated material, and the membranous portion of the urethra was incised its whole length. I then returned to the first stricture and divided it. Nothing remained to oppose the ready introduction of a catheter into the bladder, in which position the instrument was retained, and the operation considered complete.

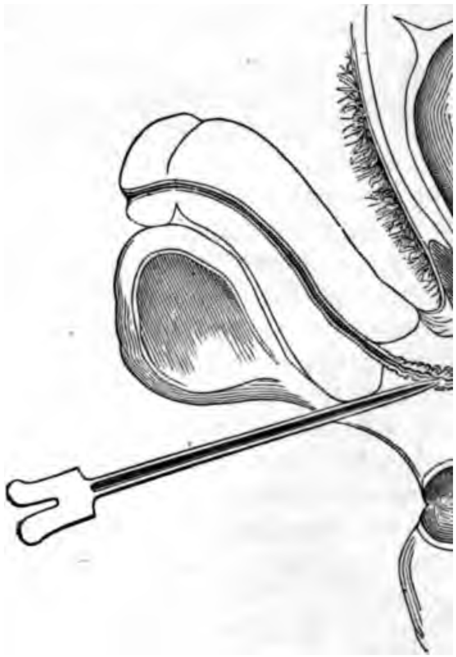
FIG. 184.



This diagram represents the point of the bistoury as having reached the bulb of the "permeator."

It may be remarked that the operation just described is not the "external division" advocated by Mr. Syme for the cure or relief of organic stricture. His operation is designed for those cases in which the urethra is permeable, the perineal incision being upon some instrument which has passed through the strictured track. His operation is con division," the execution of which is by manipulated within the urethral cana Saum, the stricture was "impermeable" the urine drop by drop, found its way track.

FIG. 185.



In this diagram the grooved director is represented of the stricture. The progress of the instrument has to of the knife.

So unsatisfactory have all operations of organic stricture, that the defect has b ble. "Once a stricture, always a strictur distinguished surgeon.

A stricture which can be permeated a neuve's apparatus, may be kept open by bladder most of the time for a couple of of a bougie every day afterwards for a itself the narrow and calloused part w same state it reached before treatment w

When perineal or urinary fistulæ exi cure except through incision of the str false passages originated, and on which their continuance depends. If a permeator and dilator can not be used, the indurated and tortuous way must be opened by a perineal section much like the one already described.

After the section has been made a leaden catheter should be kept in the urethra all the time for weeks, in order to prevent a union of the wound with the caliber of the urethra contracted. The presence of the catheter forces softening and absorption of the indurated structure.

When the urethra is occluded at a point anterior to the scrotum, and all the urine escapes through perineal fistulæ, it requires considerable tact to cut upon the urethra and to find its course in both directions, but there is no danger of failure. The way to the bladder is first opened, and then a female catheter may be employed in the outer extremity of the urethra to push the stricture down to the perineal wound where it may be incised and overcome.

A timid and inexperienced operator regards perineal sections as dangerous, but the fear is not well founded. Whenever the necessity arises for incising the perineum, the operation may be undertaken without apprehension of anything serious happening.

DISEASES OF THE GENITO-URINARY ORGANS OF THE FEMALE.

It would be out of the province of a work of this kind to introduce topics which legitimately belong to obstetrics and gynæcology. To be sure, ordinary delivery requires normal dexterity,—it is chirurgical in its nature, but no treatise on surgery contains obstetrical directions. By custom and common consent,—and very properly too,—these branches of medicine are kept, in a great measure, by themselves. To apply obstetric forceps and to use other instruments in difficult deliveries, are surgical acts, yet rules for the employment of such implements are never found in surgical works. The removal of ovarian tumors, uterine fibromata, and polypi of the womb, is legitimately surgical and the closure of vesico- and recto-vaginal fistulæ may be regarded as of a surgical nature, even though late works on gynæcology affect to cover the ground.

* * *

INTRODUCTION OF THE FEMA

This is ordinarily a very simple opera
may require a little tact in rare cases.
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or cicatrices following ulcerations and bu
sertion of a catheter a matter of some di

The surgeon's pocket case of instrum
female catheter, and so does the gynæco
catheter, whether metallic or elastic,
evacuate the female bladder. A gum
the ordinary metallic female catheter, fr
be used to conduct the urine into a
pressed close to the body. I have used a
the female bladder. The feather is cut a
is removed, the round and smooth end i
knife to complete the implement. In an
try a goose might be robbed of a large q

Ordinarily it is not necessary to expose the female genitalia in order to introduce a catheter. The meatus urinarius is in the median line of the genital fissure, and just under the pubic arch; it forms a fullness or tubercle at that point. The left hand is carried beneath the bed covering so the finger and thumb shall meet the vulva, and hold the labia apart; the right hand then carries the catheter so its entering end shall strike the pubic arch in the median line, when by gentle manipulation the end of the instrument is made to enter the urethra, and to find the cavity of the bladder an inch or more from the meatus. If the operator can not find the mouth of the urethra by digital manipulation, there is no reason why the sense of sight should not be utilized for the operation. If

Intro

the bladder be very much distended, the meatus is drawn back into the pelvis by the rising upward of the bladder; and in displacements of the womb and bladder, the urethra is dragged out of its usual course. Sometimes the catheter is to be directed upward at a sharp angle, and as often downwards, or to one side, before it will enter readily.

The meatus urinarius is occasionally the seat of a fungous development that is keenly sensitive and painful. The parts surrounding the urethral outlet bulge or protrude, and exhibit a bright redness. Urination is attended with pain, and sexual intercourse with distress. The cause of this fungous state is not well understood. Its successful treatment consists in applying a crayon of sulphate of copper to the disordered part. A crystal of blue stone may be whittled to a pencil-like point, and washed smooth in water. This may be pushed into the meatus urinarius and a quarter of an inch or so of the urethra, once a day, or every two or three days. The female may be instructed so she can use the crayon herself. She will be benefited by the first application, and may be cured in a few weeks. No internal medicine, except pinus canadensis, is required, unless a taint of some kind is known to exist in the patient's blood.

The genital labia are liable to abscess, which is mentioned in another place; and also to eczema and pruritus from other causes. The annoyance is often tormenting, and has to be borne on account of the location. Sometimes the itching comes from an acrid leucorrhœal discharge, yet oftener it depends upon an eczematous state of the parts affected. In any case, it would not be a waste of energies to use astringent and cleansing vaginal washes, and to employ tonics and peptics internally. But to select or combine an unguent or lotion which shall in every case arrest and permanently overcome genital pruritus, is not an easy matter. Solutions of borax, salicylic acid, carbonate of soda, are still in good repute for such difficulties; and so are the cerates recommended in skin diseases. An ointment made of simple cerate, common tar, and borax, has accomplished some excellent cures. There should be less tar than cerate, and a small quantity of borax. A small amount of carbolic acid put into a pomade, has given satisfaction. Pruritus of the genitalia sometimes provokes nymphomania, or teasing desires. Itching produced by the presence of crab-lice in the pubic region, must not be mistaken for the pruritus of eczema.

The labia are subject to tumors, benign and malignant, which have to be excised, as are similar developments in other parts of the body. I have oftener used the *ecraseur* to remove fungoid excrescences from the female genitalia, than I have employed the knife for a similar purpose. The instrument is excellent for many purposes where excision is demanded with little loss of blood; but for removing cauliflower excrescences from the labia, it is especially valuable.

Cystitis is a common difficulty among females. The acute form of the disease is especially distressing, and it is difficult to cure. In some cases it has been deemed advisable to make a vesico-vaginal puncture, through which the urine may drain as fast as it drips from the ureters into the bladder, and thus relieve the irritated viscus. After the cystitis has permanently subsided, the fistula may be closed by an operation for that purpose.

Pregnancy, in its earlier stages, is apt to be attended with irritability of the bladder, the sufferer having to void the urine every time a teaspoonful accumulates, whether by night or day.

Diuretics, as a whole, do more harm than good, especially if they be aromatic in the slightest degree. A grain or two of sulphate of magnesia in a tablespoonful of water may be swallowed every hour or two with some benefit. An opium suppository introduced deep into the vagina at night, helps the patient to sleep an hour or two at a time; and a laudanum and starch enema thrown into the rectum once or twice during the day, will keep up the sedative effect. Those practitioners who have never had an aggravated case of cystitis might suppose they knew of a dozen remedies that would do good and perhaps cure; but the management of a bad case would soon disabuse their minds of the innocent conceit. The diet of patients worried with cystitis should be plain and digestible. It is impossible to name articles of diet, for, what will suit one individual might harm another. The waters of certain springs have cured obstinate cases, yet the right combination can not be ascertained except by experiment. Generally every case is benefited by travel, and the recreation that comes from change of location. Elaterium has been lauded as a cure for cystitis, but I have not found the agent to be of any special value in the treatment of the disease. Gelseminum is not tolerated in many instances, though it exerts a sedative influence upon the bladder. Injecting the cavity of the bladder with weak solutions of salicylic acid and borax, has been attended with some relief.

URINARY CALCULI IN THE FEMALE BLADDER.

The female urethra is so large and short that a calculus of any considerable size rarely lodges in the bladder. I have met with urinary concretions in female children oftener than in adults. In several instances I have carried polypous forceps into the female bladder, and extracted a calculus as large as a pigeon's egg. The urethra being dilatable, a large stone can be removed without tearing the soft tissues. It is asserted that a calculus an inch in diameter can be dragged through a dilated female urethra. It is not difficult to grasp and remove a calculus the size of a plum stone.

Hysterical females may practice frauds upon their medical attendants by pushing smooth pebbles through the urethra, into the bladder, and then make an uproar until the foreign bodies have been extracted. The arch deceivers do this to create sympathy in their behalf, and to attain a certain kind of notoriety. But a medical man can soon detect this trick by breaking the stone with a hammer or other implement. The character of the broken surfaces will determine whether the stone is a urinary concretion, or a rounded piece of crystalline rock. Chemical tests will also settle the matter. When a woman is once found out in the cheat, she is ashamed to repeat the trick.

Dr. Geo. D. Coe, of Kirksville, Mo., reports that " on the 30th of November, 1875, Mr. Waymer called on me and said that his daughter Lizzie had taken something from her which was hard as a rock and large as the fist. As the girl was timid and adverse to seeing a doctor. the father asked me to call at his house as if by chance. I did as had been suggested, and found that the father had not exaggerated the matter. The calculus is pretty well represented in the accompanying diagram. It is two and a half inches in length and over five inches in circumference in the most constricted portion. Measuring over the top of the knob it is six and a half inches. It weighs four ounces. Two small calculi came away at the same time the large one was delivered. The girl had endeavored to dislodge the calculus on several occasions, but it was not until suppuration and sloughing of the vagina and vulva had occurred that the extraction could be effected.

"I obtained the following history of the case from the patient: She is now 22 years of age; eight years ago, pain commenced in the region of the bladder, and the urinary flow was often obstructed while passing water. The urine was fœtid. The general health became poor, and her father moved from New York, where he then lived, to Missouri. She had been treated for several ailments by different physicians, but would never permit an examination of her person. She ceased menstruating in July, 1873, and during the following September, she began to observe that the urine dribbled through the vaginal orifice. About this time much purulent matter and flakes of flesh escaped with the urine. Her health was so poor, and her sufferings were so great, that her parents and friends supposed she was laboring under cancer of the womb. The offensive odors arising from the urine and the purulent discharges, rendered it exceedingly unpleasant to stay in the room with her. She took large quantities of morphine to allay her pain; and her death was daily expected.

FIG. 187.

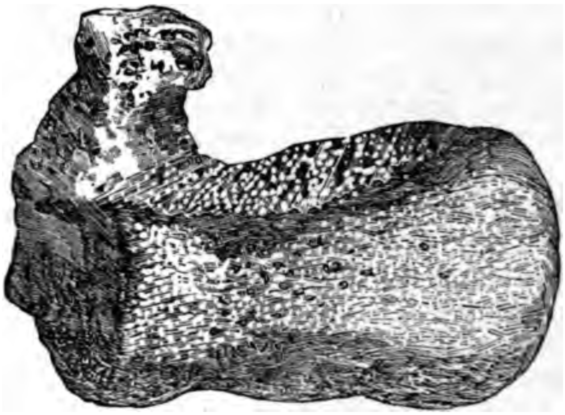

Figure of the vesical calculus which escaped through the vagina.

"At my first visit, which was the next day after the passage of the calculus, I could not make a vaginal examination on account of the extreme tenderness of the vulva. The external parts were greatly excoriated and swollen. The urine escaped, not from the urethra, but from the vagina, which led me to suppose that a vesico-vaginal fistula existed, and to conclude that the calculus was originally vesical, and having ulcerated its way into the vagina, found escape through the vulva. I ordered injections of carbolic acid and water to be thrown into the vagina, and prescribed mineral acid tonics. The patient gained rapidly in flesh and strength, and promises to attain a good degree of health, with the exception of the false communication between the bladder and the vagina.

"A few days after the first visit I called again for the purpose of ascertaining the nature and extent of the fistulous opening; and I found that the vagina was so contracted from cicatrization that an ordinary speculum could not be introduced, even a digital exploration was attended with great pain. The borders of the chasm were hard as cartilage, and adventitious bands of neoplastic tissue had dragged the bladder downwards, so that the neck of the uterus could not be discovered. Since the passage of the large calculus, a second, the size of a pigeon's egg, and nearly round, has come away. Probably this existed before the large one escaped, for its surface presents evidence of having been worn in places by contact with another calculus.

"The projection on the large stone probably formed after the large part descended into the vagina, and seems to represent the size of the fistula. The lump projected into the bladder, and was formed slowly by depositions of urinary salts.

"The patient has remained so long with the limbs flexed that they can not be straightened. Possibly time and exercise will enable this great sufferer to walk again.

"I propose to have her wear a rubber urinal until an operation can be performed for the purpose of closing the vesico-vaginal communication.

"This is not the first case of a vesical calculus finding its way into the vagina by ulceration of the vesico-vaginal septum, but it is rare enough to be remarkable."

A calculus in the female bladder which is too large for extraction through the urethra, may be crushed with a lithotrite, after which the fragments may be removed with forceps. It is not advisable to perform the supra-pubic incision to get at the calculus. It is safer to incise the vesico-vaginal septum, and remove the stone through the vagina. The fistulous opening could then be closed with sutures, and otherwise managed as a vesico-vaginal fistula.

OVARIAN DISEASES.

The ovaries are organs which have an exalted vital endowment, and are subject to various diseases. Inflammation of the ovaries attends baffled menstruation, miscarriage, and many disorders of the uterus; and it is usually attended with chills, general fever, and intense pain at intervals. It is to be relieved by the use of laudanum and starch enemas thrown into the rectum, and by the application of hot crockery plates to the hypogastrium. Mineral acid and quinia may be employed to advantage in those cases where the cause seems to be septicæmic, as is often the case, putrid fluids having been absorbed from the uterine cavity.

Abscess of the ovary is likely to prove fatal unless the purulent fluid find its way into the cavity of a fold of adjacent intestine. Such an issue is not uncommon. The seat of the disease is so far removed from direct treatment that little can be done to disperse the nascent disease, and to direct the pus through a safe outlet after suppuration is established.

Cancer of the ovary is sure to result fatally, therefore the treatment is to be of a palliative nature. It is difficult to diagnose the disease until it is too late to think of excising the morbid mass. Tumefaction manifests itself in the right or left hypogastric region, which may lead to the suspicion that a fibrous or cystic form of ovarian disease exists, consequently gastrotomy is often performed before the real nature of the disease is made known.

Fibrous enlargement of the ovary is not uncommon; yet in most instances the tumor never gets larger than a child's head, therefore no great inconvenience is experienced. So many fibroid tumors of the ovary do inconsiderable harm, that it would be unjustifiable to perform ovariotomy before it was known whether the disease exhibited fatal tendencies or not. An exceedingly large fibromatous tumor of the ovary can not be safely removed; and no known system of treatment has promised anything substantially curative.

Cystic disease of the ovary is very common; and fortunately amenable to surgical treatment. A century ago there was no hope for those who possessed an ovarian cyst, but ovariotomy has lately been introduced, and proved a scientific performance.

Gastrotomy, for the removal of ovarian cysts, was first performed in 1809, by Dr. Ephriam McDowell. During the fifty succeeding years the operation was performed mostly by a few bold operators who attained no great eminence in other branches of surgery. This circumstance arose from the fact that it required very little anatomical knowledge and a moderate amount of skill to lay open the abdomen, evacuate a cyst, ligate its pedicle, excise the collapsed sac, and then close the ventral wound. However, I would not under-rate the tact and experience demanded to establish a correct diagnosis, or the patience and perseverance needed to avert the dangerous symptoms likely to follow ovariotomy, requiring surgical accomplishments of the highest order. But, in many instances, the surgeon, soon after the operation was completed, left the patient in the hands of the family physician, who, whether competent or not, succeeded to the most difficult and perplexing part of the treatment. An unfortunate issue was not unfrequently charged to the attending physician, and the operator escaped censure.

It is a noteworthy fact that those surgeons who first achieved distinction as ovariotomists were Americans, and not practitioners in large cities. Dr. Ephriam McDowell, "the father of ovariotomy," began and continued his professional labors in Danville, a town of moderate proportions in the interior of Kentucky. Dr. Walter Burnham, a veteran ovariotomist, lived in Lowell, Mass., and so did Dr. Kimball. Dr. J. L. Atlee was a practitioner of medicine and surgery in Lancaster, Penn. Dr. Bradford was located at Augusta, Ky., and Dr. Dunlap at Springfield, Ohio. Dr. Peaslee began his career as an ovariotomist in the rural districts of New England, though at present established in New York City.

Dr. T. Spencer Wells, of London, performed his first operation in 1858, and has since operated five or six hundred times, rivaling in a brief period all contemporaries. His extensive experience and success have done much toward rendering ovariotomy "legitimate." Dr. Burnham always entertained liberal ethical views, associating indiscriminately with Eclectics, Homœopaths and Regulars, consequently his labors and achievements have been ignored by Allopathic authorities. He performed ovariotomy several times each year from 1845 to the time Mr. Wells executed his first operation,—a series of years which may be characterized as constituting the "unpopular" period of ovariotomy, yet his name is not mentioned by Peaslee, Atlee, or

Wells, the three latest authors upon ovariotomy. **Prof. Peaslee** tabulates American surgeons who have operated only three or four times, yet studiously ignores the name and fame of one who has performed two hundred operations!

Ovariotomy was slow to be recognized as a legitimate operation, because it was difficult to establish a correct diagnosis in ovarian diseases. Many times an operation was begun, and abandoned because a uterine fibroid or other abdominal tumor was discovered. Even hepatic and renal abscesses were mistaken for ovarian growths. Mr. Wells once opened the abdomen with the expectation of finding an ovarian tumor, but came upon a monstrously enlarged spleen which reached from the diaphragm to the pelvic cavity, and greatly distended the parieties of the abdomen. Dr. Marion Sims was present and assisted in the diagnosis. I once made an exploratory incision in an obscure and doubtful case, and encountered a spleen which would probably weigh about forty pounds. But it may be a question whether mistakes in diagnosis, which in most instances are avoidable, can be justly charged against ovariotomy? Charges of the same nature might as legitimately be brought against lithotomy, and other established operations in surgery.

Ovarian tumors present a variety of features. The cystic form is the most common, though the solid is not exceedingly rare. An ovarian tumor which is chiefly fibroid, yet embracing a cyst, constituting a mixed or compound tumor, is occasionally met. Besides, ovarian disease may be carcinomatous, and present an endless variety of morbid phases.

Cystic disease of the ovary is presumed to arise, in many instances, from the imperfect evolution of an ovum, though ovarian cysts do occasionally develop previous to, and succeeding the menstrual epoch.

An ovarian cyst may consist of a single sac and its contents (unilocular); or embrace several sacs, each with different contents (multilocular). A single sac, which is usually globular in form, is also called *monocystic*; while a tumor with several compartments, exhibiting in its outline lobulated projections, is denominated *polycystic*.

Ovarian tumors must be exceedingly minute bodies at their beginnings, but their growth is often so great that a cyst and its contents will weigh one-third as much as the whole body of the possessor. Ovarian tumors of the cystic variety are not generally discovered until they are as large as the fist, but their growth is usually so rapid that they destroy life from mechanical interference in the course of two or three years.

The walls of an ovarian cyst present three distinct layers—the outer is peritoneal, the middle fibrous, and the inner epithelial. The thickness of the sac varies greatly; sometimes it is so thin that it readily bursts spontaneously, or when rudely handled; it is often a quarter of an inch thick when well developed, and it may be much thicker, especially as the pedicle is approached. The peritoneal layer is often much thickened, particularly in places.

The Fallopian tube usually lies conspicuously upon the distended cyst, and the ovary is lost to view. The contents of ovarian cysts exhibit variety in color, character, and consistence. The liquid may be a little denser than water, and is often as dense as jelly, especially in polycysts, the contents of some sacs refusing to flow through a large canula. A flocculent, curdy, brainy, or gruel-like fluid is very common, the flakes in some instances being large enough to clog a small canula. A straw-colored fluid, not apparently different from that of ascites, is frequently observed, especially at a primary tapping. The fluid obtained at the later of repeated tappings is apt to show an admixture of albuminous and gelatinous materials, and exhibits a darker hue. Pus may constitute the greater part of the enclosed fluid.

The quantity of fluid in ovarian cysts is only limited by the resistance resident in the abdominal walls. It is not uncommon to draw off six or eight gallons of fluid, and then leave a gallon or two in the collapsed sac. After a patient has been tapped once, the fluid rapidly returns, because the resistance originally afforded by the abdominal walls is lost. Patients have survived a hundred or more tappings, the operations being performed every few months at first, and every few weeks at last. If the fluid drawn off be thin, or contain little organic matter, the exhaustion is not rapid.

In what are called dermoid cysts, sebaceous matter, wads of hair, osseous material, and quite well developed teeth, have frequently been found. Such tumors, instead of an epithelial lining, seem to possess tegumentary elements within. They are rarely sufficiently large to necessitate removal.

Ovarian fibromata, or solid tumors of the ovary, exhibit some diversity of structure, though they resemble each other in loca-

tion and outline. Cartilaginous and osseou
have been reported, yet not in abundance.
is generally limited to the size of the fist, an
plicated with ascitic accumulations. A tr
not very common. Its size is usually restr
seldom demand ovariotomy. During devel
be moved from one side of the abdomen
little to distinguish it from a growing ov
hardness.

An ovarian cyst first shows itself in one
spaces; and when no larger than a child's
across the median line of the body to the
turned. The fact that the tumor begins at
brim, and rises as high as the umbilicus,
into the middle space, is pretty good evide
is ovarian. The development of the tum
reached the umbilicus, is directly upward, ti
stomach, and other viscera of the epigastri
ously, the tumor grows in the direction of
projects forwards, as well as expands later
ference to the body at the umbilicus of fort
this period of development, the functions o
cera, from mechanical pressure, are greatly
of other parts of the body, indirectly or s
patient becomes emaciated, and exhibits a
pression of countenance, which has been gr
facies ovariana. The superficial veins of
enlarged and prominent in the advanced
ease, and the feet and ankles exhibit œdemat
stipation, slackened action of the kidneys,
and signs of exhaustion and approaching
toms which appear sooner or later. If the
one ovary, menstruation continues until t
faulty nutrition and general prostration.

The diagnosis of an ovarian cyst is no
depth of the uterine cavity be determined
position and mobility of the womb ascertain
ovarian the cavity of the uterus should be
dition of the uterus behind the tumor, cause
the ovarian character of the disease. The
ovarian tumor can be felt *per vaginam* and

By percussion of the abdomen, it can often be decided whether the tumor is cystic or solid. A tumor with fluid contents will fluctuate, though the wave created in a tense sac is not very marked. Palpation may aid in distinguishing between a monocyst and a polycyst, though the lobular projections are not always distinct, nor is the fluctuating impulse sufficiently well defined to determine whether the fluid movement is in one or more sacs.

An exploratory trocar, or the common hypodermic syringe, may be used to obtain a few drops of the fluid from an ovarian cyst. To be sure, such instruments are too small to be certain of collecting any of the fluid, but the entrance of even an exploratory needle within a sac, is determined by the free movement of the point of the instrument *within* a cavity. The fixedness of an exploring instrument in a solid tumor is marked and decisive.

Those who are versed in chemical and microscopic examinations of fluids drawn from ovarian cysts, claim to be able to distinguish between cystic and ascitic products. It is possible that valuable conclusions may be obtained by such means.

Among the commoner tumors of the abdominal and pelvic cavities, which in various ways resemble ovarian growths, is the *uterine fibroid.* Experienced surgeons have laid open the abdomen with the expectation of finding an ovarian cyst, and abandoned the operation when the real nature of the disease was discovered.

The uterine fibroma has some symptoms in common with the solid ovarian tumor; yet a few of the peculiarities of each are distinctive, and ought not to be mistaken. A fibrous tumor of the uterus may begin beneath the peritoneal investment, and become pedunculate. Such a growth can not well be determined from a solid tumor of the ovary. But many fibrous tumors of the uterus arise in the substance of the organ, and transform the uterine stroma into their own degenerate tissue, enlarging the uterus, as it were, but not with the regularity of ordinary hypertrophy. The tumor is spherical or ovoid in shape, and has no movements independent of the uterus.

The most prominent features of a uterine fibroid are, 1st, slow development; 2d, tenderness during menstruation, and manipulation; 3d, central and pelvic in origin and location; 4th not easily moved from normal position, but fixed, as if adhered to surrounding structures; 5th, sometimes lobulated and irregular

in outline; 6th, the sound discovers an el
uterine cavity; 7th, hemorrhages from the

Although the symptoms and peculiarities
sufficiently constant to be worthy of note,
distinct and invariable. The growth of a u
as rapid as that of an ovarian cyst, and exhi
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develop to the right or left, and be movabl
the shape of the tumor may be oval, and as
as an ovarian cyst; and the uterine cavity
retain its normal depth, even when the su
has considerably changed.

Uterine fibro-cysts are sufficiently comm
tion in this connection. They probably be
and develop a cyst in their advanced stages.
of the uterus exhibit nearly the same char
fibroids, except the upper and cystic pa
Such tumors are more likely to form adhesi
structures than ovarian cysts.

Ascites and pregnancy have been mistak
so have solid and hydatid tumors of the
of other unusual and pathological condition
as resembling ovarian growths, such as
kidney, physometra, and cystic developmen
nal cavity. Excessive obesity, "phantom-tu
pregnancy" are recounted as conditions bea
ovarian tumors, though it does not appea
could result from such mistakes, as the sy
ciently pressing to demand an operation.

Ascites is to be distinguished by the hist
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fluctuation, and the fluid has a hydrostati
highest parts. Anæmia manifests itself
while in ovarian disease it comes on late
diuretics reduce the quantity of ascitic flui
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rare to find ascites without œdema of the
genitals. The inexperienced in reading t
that have been made in the diagnosis of o
clined to ridicule diagnostic blunders, but

the difficulties which sometimes attend the diagnosis of obscure and complex diseases, are more charitable toward those who commit errors.

Evidence of adhesions between the external surface of an ovarian cyst and adjacent structures, is not very reliable. If the tumor be immovable, and the abdominal walls can not be made to glide independently from side to side, when gathered up and manipulated, adhesions are to be presumed. If the tumor falls perceptibly during a deep inspiration, extensive adhesions do not probably exist. Repeated tappings do not necessarily establish firm adhesions. Deep-seated and prolonged painful paroxysms in a particular region indicate that repeated inflammatory attacks may have been followed by adhesions, as in pleurisy. But, as only extensive adhesions constitute a substantial obstacle to ovariotomy, the existence of a few connecting bands need not create serious apprehensions.

An ovarian tumor necessarily has no pedicle at first, but acquires one as the growth develops. The uterine fibroid and fibrocystomata, except they be sub-peritoneal in their origin, develop in a mass without a pedicle, hence they do not permit of removal unless the uterus be extirpated, or enucleation be possible from within the organ. If an ovarian tumor occupy the pelvic cavity, and the fingers can not be pressed between the pubes and the tumor, the presumption is that the pedicle is short, and *vice versa.* Those operators who use the clamp endeavor to estimate the length of the pedicle before the operation is begun.

Tapping a monocyst is not a dangerous operation, as experience has taught, but the puncture of a polycyst has been followed by serious consequences. The fluid of a multilocular cyst is sometimes exceedingly acrid; and the paracentesis is often attended by the escape of more or less of this fluid into the peritoneal cavity, where it may excite fatal inflammation. The spontaneous rupture of a monocyst may result in recovery, but the bursting of a polycyst is generally fatal, though a moderate amount of fluid gets into the peritoneal cavity. The explorative puncture of a polycyst should be promptly followed by ovariotomy.

Sometimes the diagnosis of a ventral tumor can not be established without making an incision an inch or two in length through the abdominal walls. This tentative incision is to allow a steel sound to slide between the tumor and surrounding structures, to ascertain the extent of adhesions and the character of the disease. If it be thought best, after this examination, not to proceed with the operation, and remove the tumor, the wound in the abdomen is to be carefully closed, and the patient treated as if danger was impending. In the majority of instances, if the wound be small, and little violence done to structures within the abdomen, the patient will recover without an untoward symptom, yet fatal results have followed these tentative explorations.

The prognosis of ovarian cysts, when left to themselves, is decidedly unfavorable. Some accidental circumstance, as has happened in hydrocele, may result in absorption of the fluid and shrinkage of the sac. A blow that failed to rupture the tumor, yet excited just enough inflammation to arrest the progress of the disease, might in rare cases be followed by a cure. However, favorable results are not to be expected, but a fatal termination in from one to five years. Few patients live over two years after an ovarian cyst is large enough to be discoverable. Repeated tappings may postpone the fatal issue. The discomfort produced by a developing ovarian tumor is not usually great, but during the last stages of the disease life becomes a burden, the distress being almost constant.

The medical treatment of ovarian tumors has thus far proved futile. It has been claimed by a few experimenters that active medication by means of cathartics and diuretics, has reduced the size of the abdomen to a marked extent, but reliable reports of cures by such means are not to be found. The use of iodine in various forms, has been extolled. So also the exhibition of the ammonium and the potassium mixture, yet none of these agents can be depended upon to perform a cure. Pressure by means of elastic bandages, has temporarily retarded the growth of ovarian tumors. Electricity in various forms has been employed in vain.

The injection of ovarian cysts with iodine has been followed by cures. The operation is performed by using a large trocar and canula for puncturing the cyst and drawing off the fluid; and then employing a gum or silver catheter carried through the tube to the bottom of the sac to convey the iodine, which is forced in with a syringe. The tincture of iodine at full strength and an ounce or more in quantity, has been employed, though a larger quantity in a dilute form has been preferred. The injection is allowed to remain in the cyst five or ten minutes, then permitted to escape through the catheter. The manipulation should be conducted with care and caution lest the contents of the tumor, together with more or less iodine, get into the peritoneal cavity, and excite grave or fatal inflammation.

Repeated injections of iodine, weeks or months apart, have been performed to cure obstinate cases. Soon after an injection is performed the patient can *taste* the iodine very perceptibly. In fact the agent can be detected in the sweat, urine, and other fluids of the body. It would seem that fatal poisoning might occur from the absorption of much iodine, but such has not been the case.

The injection of iodine into an ovarian cyst is not attended with pain, unless some of the fluid accidentally reach the peritoneal cavity. It was assumed at first that the iodine injection produced a cure, as in hydrocele, by inducing a proper grade of inflammation, but it is now known that in cases of cure the action of the iodine upon the lining membrane of the cyst arrests its secretory power, after which the sac shrinks, yet, even then, the cystic cavity is not entirely obliterated. The method of cure by injection was once very popular, but an occasional death and the many failures, together with the favorable rise and progress of ovariotomy, have nearly ended the iodine treatment.

Dr. Noeggerath, of New York, has demonstrated that an ovarian cyst may be evacuated by establishing a permanent fistula between the cystic cavity and the vagina, the puncture being made behind the cervix uteri, as if to reach the Douglas *cul-de-sac.* After the fistula is established the cavity of the ovarian cyst can be reached with iodine or other injections. As the drainage through such a dependent point must be easy and complete, the operation would be of value in cases of "unfinished ovariotomy" from extensive adhesions.

Eclectro-galvanism has been employed for the purpose of dispersing ovarian cysts and morbid developments of the ovary, and quite a number of cases are reported, but it must be considered that the advocates of such agencies are men who know little of a surgical operation, and therefore seek to avoid what they can not execute. By zealously championing a method which is not attended with danger, not a few sufferers are led to try the subtle and mysterious agency; and as persons that apply for relief do not all have tumors, the electrician gets some credits that do not belong to him. Electro-galvanism is an extremely uncertain remedial agency in the treatment of any disease, therefore its cures may safely be credited to the dispersion of *phantom* and other flatulent swellings. As has been stated, a hydrocele may occasionally disappear without an operation; so may the fluid be absorbed from an ovarian cyst, yet such an event is not ordinarily to be expected, even if electricity be employed in some alleged *scientific* form.

OVARIOTOMY.

The surest method of getting clear of an ovarian tumor is to extirpate it. The operation is as legitimate as that of lithotomy, and about as free from dangers. Gastrotomy is attended with risk to life, therefore a patient who has a moderate sized tumor which gives little discomfort, should not have her life subjected to unusual peril any sooner than is necessary. In fact, the greatest success is attained when the operation has been performed upon patients somewhat impaired in their general health by the encroachments of the disease. On the other hand, the operation is not to be delayed till, from exhaustion, great risk is incurred from shock and inability to re-act and recover. It has been urged that delays are attended with greater hazard from multiplied adhesions, yet the point is not well established.

The dangers attendant upon ovariotomy are various. The greater number of deaths arise from septicæmia or blood-poisoning. Peritonitis was formerly supposed to be the leading cause of fatal terminations, but that opinion is becoming modified. Hemorrhage is enumerated as a risk, though it can generally be well guarded against. Abscess of the stump and cellulitis have occasionally taken a victim. Unfavorable influences following the separation of extensive adhesions have led to fatal terminations. Shock and collapse are exhibited at once, and rarely reach the second day. On the third day there is danger from peritonitis and pyæmia.

Young females are in danger from hemorrhage as well as inflammation; and old women sometimes fail to re-act. The oldest patient ever operated upon was seventy-eight, and the youngest six years and a few months old. Females under twenty do not endure the operation as well as those in the middle period of life.

A patient about to undergo ovariotomy should be in as good condition as it is possible for a person to be who is mentally and physically worn down with a depressing disease. The stomachs of patients affected with ovarian disease are apt to be atonic and irritable, therefore an attempt should be made to improve the digestive organs with bitter tonics, iron, and the mineral acids. The bowels should be kept in a soluble state, if possible, and freely evacuated twenty-four hours previous to the time set for operating; and it is well to administer an anodyne the night preceding the operation to secure sleep or a state of repose.

As a general rule, the extremes of heat and cold are to be avoided as the best times for operating, though patients can often be kept comfortable in the coldest or hottest seasons. Somewhere near the middle of the day is the preferable time to operate. Private residences, especially in the country, are the best places for severe operations to be performed,—at least, if malarious influences can be avoided. The temperature of the room during the operation should be kept above 80°, though ventilation is to be free as soon as the operation is over.

The patient may rest upon a table four or five feet long and two feet wide while the operation is being performed. A folded quilt and rubber cloth or sheets to absorb fluids, constitute the covering for the table. Pillows are also requisite. The patient should have the body dressed in ordinary under clothing and a loose gown; and stockings and flannel drawers should cover the lower limbs. A nice bed should be convenient to receive the patient as soon as the operation is completed.

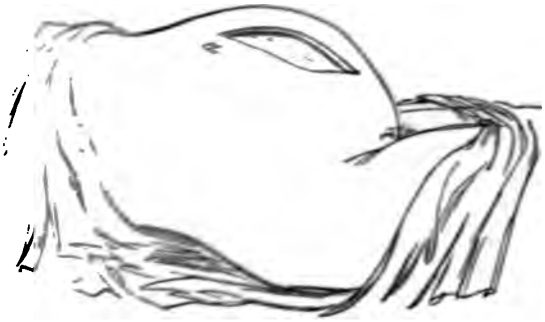
The instruments needed are mostly in a full pocket case, though a sound to explore for adhesions, etc., a variety of needles, two or three sizes of silver wire for sutures and ligatures, are to be at hand. If a clamp is to be used, that should be in readiness; and if drainage tubes are to be employed, they should be within reach. It is well to have at hand a solution of persulphate of iron to apply to bleeding surfaces, and a supply of silk to ligate vessels embraced in adhesions. An experienced ovariotomist usually has several kinds of dressing and artery forceps, and one long pair, with delicate teeth, to reach a deep cavity in case of need. A supply of soft new sponges, carefully washed and prepared, is essential.

Two or three assistants are necessary, besides the one who administers the anæsthetic. If it be not convenient for the instruments to be within reach of the operator, an assistant is needed to hand the different implements as they may be called for. Basins of warm and cold water should be conveniently near; and

The person who manipulates the sponges is to be instructed when the warm water is wanted.

The patient should have a female attendant who is to know that the bladder has been recently evacuated, and who is to arrange the clothing, bedding, etc., the surgeon making suggestions and giving directions.

FIG. 188.

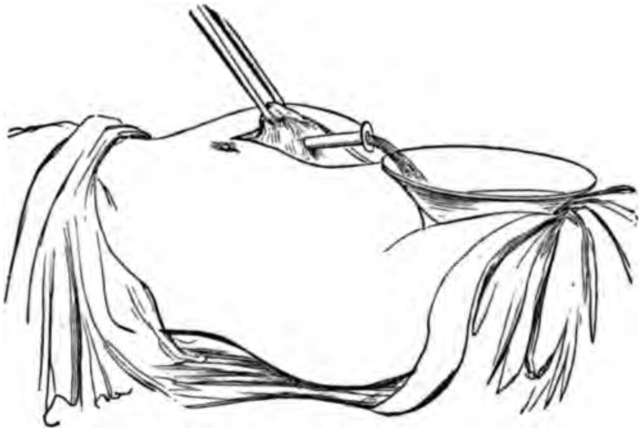


Primary incision in abdominal walls.

All preliminary arrangements being complete, the operator makes an incision with a scalpel from a point just below the umbilicus, along the median line, to a point an inch or two above the symphisis pubis, the knife dividing skin, fat, fascia, and the tendinous walls of the abdomen—the latter, however, being incised by light touches lest the tumor be gashed, and other mischief done. The peritoneum should not be opened until all bleeding is checked; and care must be exercised by the inexperienced surgeon, lest he, mistaking the peritoneum for the outer layer of the tumor with adhesions, begin to tear the peritoneum loose from its abdominal connections. When the peritoneum is reached, a small fold may be raised with forceps, and then nicked with a knife. As soon as an opening is made in the peritoneal cavity, serum will escape, and in considerable quantities, too, if the patient have ascitic accumulations. The incision in the abdominal walls is to be exended by using a grooved director in the peritoneal wound to guide the knife until the fingers can be used in place of the director. As soon as the incision is completed to the extent of an inch or two, a steel sound is to be used to explore the surface of the tumor in all directions, to ascertain its character, size, and shape, and especially to discover adhesions. It being satisfactorily demonstrated that the tumor is cystic, and not extensively adhered, its walls are to be seized with forceps having long, sharp teeth, and punctured with a large trocar and canula. A basin is in readiness to catch the contents of the sac as soon as the trocar is removed.

As the cyst becomes evacuated, its loose and collapsed walls are to be dragged out through the wound in the abdominal walls, thus keeping the peritoneal cavity from receiving any of the cystic fluid that might escape by the side of the canula. After the cyst is well emptied, the hands and forceps are used to drag the collapsed sac through the abdominal wound. A polycyst may need to have several cysts tapped, one after another, to lessen its size, and the abdominal incision may have to be extended to allow of an easy and free delivery. The upper extremity of the incision, if it has to be extended, should be carried a little to the left of the umbilicus, as the remains of the umbilical vessels lead to the right, and should not be injured.

FIG. 189.



Evacuating the tumor through a canula. Forceps are seen dislodging the sac as fast as it is emptied.

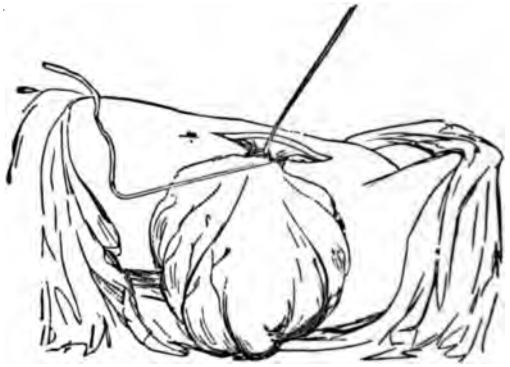
Adhesions are to be torn across near the tumor, or at the expense of the cyst walls. Bleeding produced by rupture of the adhesions is to be attended to at once, either by torsion, ligature, or styptics. Adhesions between the tumor and omentum or colon, are to be severed cautiously, as quite large vessels sometimes pass between these structures and the cyst walls.

As soon as the collapsed sac is turned out of the abdomen, the pedicle is to be carefully inspected, as well as the uterus and surrounding organs and structures. If no obstacle impede the course of the operation, the pedicle is to be secured according to the necessities of the case, or the fancies of the operator. If a clamp be employed, the instrument should be adjusted as close to the sac as practicable, so that traction upon the stump and its connections may be avoided as much as possible. When the clamp is adjusted and tightened, the sac may be excised with shears, and the abdominal wound closed with sutures, the stump occupying the lower angle of the incision. This is called the *extra*-peritoneal treatment of the pedicle, in contra-distinction to the *intra*-peritoneal, which calls for ligation of the pedicle, and its enclosure within the abdominal cavity.

The method of treating the pedicle with a clamp is a favorite with T. Spencer Wells, and has many champions in this country. The clamp secures the stump against hemorrhage, and retains the traumatic surface outside the peritoneal cavity. Besides, the stump is not so closely grasped by the walls of the abdomen as to prevent drainage in some cases.

The clamp treatment of the pedicle has some objectionable features. It is a clumsy method at best, and a short or thick pedicle can not be secured with a clamp outside of the abdomen. The method does not admit of drainage, except what incidentally arises from the loose surroundings of the stump.

FIG. 190.



Ligating the pedicle with silver wire.

So much traction is sometimes made upon a clamped pedicle that the instrument has to be removed; and the stump has slipped from the clamp or from the ventral wound, and tumbled into the abdominal cavity, endangering hemorrhage and septicæmia.

While there will be some operators who prefer the clamp, and others who, following McDowell, ligate the pedicle and bring the ends of the ligatures outside the abdomen at the lower angle of the ventral wound, I follow Sims, and constrict the pedicle with silver wire, and drop the stump of the tumor, after the sac is excised, into the peritoneal cavity.

The constricting medium is employed as follows: I take a piece of large silver wire two feet long and double it in the middle; the loop thus made is slid under the pedicle; then one free end of the wire is pushed through the loop, and force is used with the hands upon the free ends of the wire to make snug the ligation. A few twists of the two free ends of the wire secure a reliable fastening. To make the constriction doubly sure, the remaining free ends of wire may be used in surrounding the pedicle a second or third time, a twisted knot being made at each surrounding. Two turns are generally enough. The ends of wire are then cut off with scissors, and the cut surfaces are, by means of forceps, bent and forced into the pedicle near the constriction. This manœuvre prevents the rough points of wire from jagging the delicate surrounding structures. The collapsed sac is then cut away by dividing the pedicle with sharp shears at a little distance from the metallic ligature. If the division be too near the ligature, the loop may slip off, and endanger hemorrhage, though a shears-cut tends to obviate bleeding.

In a few days the silver ligature is so completely embedded in the stump that it could not be seen if an opening were made in the abdomen for any cause. And the encased ligature will remain as long as the patient lives without creating the least disturbance.

The next step in the operation is to establish drainage. My self-retaining drainage-tube, made of silver, and of the size and shape represented in the accompanying diagram, is to be introduced into a puncture made from the Douglas *cul-de-sac* to the vagina. The insertion of the tube is accomplished as follows: the left hand of the operator is carried through the ventral incision, even to the pelvic cavity, behind the uterus. Then the fingers grouped at the points rest in the bottom of the Douglas *cul-de-sac*, or recto-vaginal fossa. The right hand directs a trocar and canula (the latter the size of the drainage-tube), along the vagina of the patient till the point of the instrument rests against the peritoneo-vaginal septum, opposite the fingers of the left hand. The fingers in the abdominal or pelvic cavity feel the presence of the point of the trocar, and hold away folds of intestine, so that the plunge of the instrument shall not do mischief.

After the plunge is made, the left hand fingers hold the canula while the right hand withdraws the trocar. The right hand then lays down the withdrawn trocar, and takes up an eyed probe, which has a piece of silver wire reaching from its eye to the hole in the point of the tube. The probe is carried along the inside of the left hand to the peritoneal end of the canula, the left hand fingers assisting an entrance of the probe to the open mouth of the canula. The probe is easily made to pass through the canula and to appear at the vulval aperture, where it is grasped with the fingers of the right hand, and brought out. The wire, reaching from the probe to the tube, is now pulled upon, carrying the tube into the abdomen, and directing its small end to the mouth of the canula, where the fingers of the left hand guide the instrument, while the right hand removes the canula and pulls the tube into the peritoneo-vaginal aperture. The enlarged head on the tube renders it self-retaining. The perforations in the head and neck of the tube being large, readily admit the passage of fluids, and even small coagula. If the tube be introduced into the lower part of the recto-vaginal fossa the pelvis will be freely drained. The ends of wire reaching from the tube through the vagina and vulva may be attached to a tape surrounding one thigh. The wire is a guide to the tube and prevents it slipping upwards. It is also needed to pull the tube into the vagina when removal is necessary. The enlarged head of the tube makes the instrument self-retaining; yet the peritoneo-vaginal tissues are sufficiently yielding to allow the tube to be dislodged under moderate force.

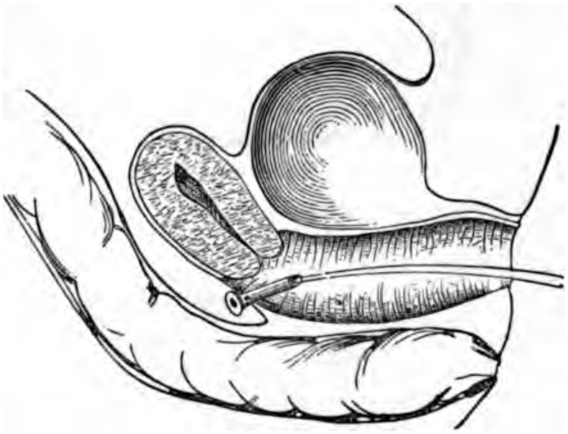
FIG. 191.

Self-retaining drainage-tube.

I have used the self-retaining drainage-tube in several cases. In the first instance the tube drained the abdominal and pelvic cavities thoroughly, no unpleasant symptoms occuring during the period of recovery. Dr. Sharp, of Lexington, Ky., under whose charge the first patient was for several weeks before and after the operation, injected through the drainage-tube carbolic acid largely diluted with water. This always gave relief when restlessness and fever came on. The tube discharged about a pint of fluid a day for several days, then less and less, till the flow, about the twentieth day, ceased, when the instrument was removed by gentle traction. Some fluid leaked through the aperture for several days, and then the discharge ceased altogether.

The third operation was performed in Logansport, Ind. The patient had a monocystic tumor, which secreted pus, as had been ascertained by Dr. Shultz in two or three tappings. The case was not considered a favorable one on which to operate, on account of suspected complications, and the very delicate health of the patient.

FIG. 192.



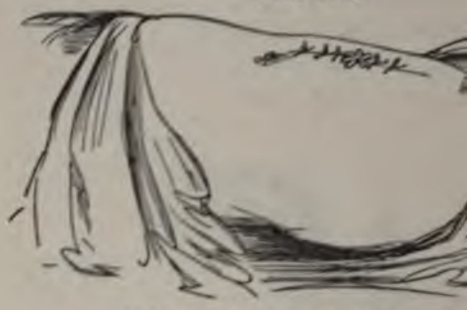
The self-retaining tube in the peritoneo-vaginal septum. A small wire reaches from tube through vagina to thigh.

The operation was executed very quickly, not over thirty minutes being occupied in administering chloroform, incising the abdominal walls, tapping the cyst, dislodging it, ligating the pedicle, inserting the drainage-tube, sponging the peritoneal cavity, and closing and dressing the ventral wound. Considerable prostration followed the operation, yet the patient gradually rallied, and made a satisfactory recovery. By accident the drainage-tube was pulled out of place after being in ten days, yet fluid continued to discharge for several days through the aperture the tube had occupied. As this opening closed or grew small by the healing process, the patient began to exhibit signs of "peritonitis;" the abdomen became distended and vomiting set in. Luckily at this critical moment, the ventral wound tore open to an extent sufficient to permit of free drainage; and a quart of fœtid, purulent fluid was thus evacuated in a few hours. The discharge from the ventral opening continued for several days.

The pelvic drainage tube is a necessity in most cases. It takes the fluid from the most dependent portion of the peritoneal

cavity. Folds of intestine in the Douglas ca
the holes in the head and neck of the tube, y
tube upward an inch or so, and swaying it fr
well as rotating it, we may re-establish draina

FIG. 193.



Abdominal wound closed with silver sutu

The older ovariotomists may not admit that
sential feature of well performed ovariotomy
lished reputation may furnish them with plent
to display an aversion to innovation; yet pro
and those who fail to recognize improvements n
What is to become of the poisonous fluids con
matic surfaces in the peritoneal cavity, after or
The blood, serum, and lymph from lacerated a
exuded from the stump, and the *debris* of the s
ture, to say nothing of the exudations from
which may fall into the abdominal cavity, must
peritoneum is not a rapidly absorbing men
would oftener arise.

Fluids pent up in the peritoneal cavity m
changes which render them exceedingly toxic
even to handle the fluids found in the perit
death occurs from gastrotomy. Common sens
fluids should be drained away as fast as they f
me that the time is coming when an ordinary
of the abdomen, whether by knife or bullet, w
but enlarged, and supplied with drainage appa

The injection of warm water into the periton
drainage tubes, affords a sense of relief when
pyæmia exist. A pint, or even a quart, of wa
at a time. As the water drains away it takes

animal matter which is undergoing decomposition. The introduction of disinfectants, such as liquor sodæ chlorinatæ, in a dilute form, may save a poisoned patient. Peaslee was the first to advocate intra-peritoneal medication, or abdominal disinfection; and others have followed the plan, and found it valuable to relieve pyæmic manifestations.

Before the ventral wound is closed, in the progress of the operation, the peritoneal cavity should be carefully inspected, and all sanguineous fluids removed with sponges. Clots of blood may block up the drainage tubes, and thus defeat the purposes for which they are employed. Although an operation can not be executed too quickly, if it be well done, a blood-vessel, which at first was not observed to be in a bleeding state, may exhibit a tendency to bleed in the course of a few minutes, therefore a too early closure of the abdominal incision is not always for the best. It is prudent to scrutinize the severed pedicle, and traumatic surfaces suspected to be hemorrhagic.

The ventral incision should be closed with silver sutures of the interrupted variety, placed about a half inch apart, the peritoneum being included in each suture. There was once a dread of puncturing or otherwise injuring the peritoneum, but experience has taught that the membrane is not so *inflammatory* as formerly supposed. Adhesive strips may be applied between the sutures, and a bandage surrounding the abdomen may be pinned across the wound. If a ventral drainage tube be used, the compress covering it should be examined two or three times a day, and the escape of fluids through the tube favored. Gentle pressure upon the sides of the abdomen tends to bring enclosed fluids to the point of evacuation.

Enucleation of an ovarian tumor, in cases where removal is not practicable, has been recommended by Dr. Miner, of Buffalo, N. Y. The term means the separation of the kernel from the husk; and in surgical language it signifies the cleaving of a tumor from its capsule. In a cystic tumor of the ovary, the outer envelop consists of peritoneum; the inner or lining layer is also a serous layer, and exceedingly thin; and between these is a fibro-cellular structure which possesses considerable strength and thickness. In some instances it is an inch thick, though ordinarily not two lines in thickness. To make an incision four or five inches in length, going through the walls of the cyst, and then using the fingers and forceps to cleave the two inner layers, both as one, from the outer or peritoneal layer, is to perform *enucleation*. The abdomen is first to be opened by an incision five or six inches in length, then the ovarian sac evacuated through a canula: space is thus given for the work of enucleation. After the cleaving process is well begun, the separation can be effected quite rapidly, except at spots where inflammatory deposits have intimately united the cyst-wall and the peritoneal capsule. In a polycyst there are usually many spots where the cleavage is obstructed by the presence of nodules and morbid masses which, in their growth and development, obliterate the loose space between the peritoneal envelop and the cyst-structure, therefore it is generally impossible to completely enucleate an ovarian polycyst. The enucleation of a monocyst can be executed with ease and speed, the peritoneal capsule and the cyst-structure coming apart as readily as the peel and pulp of an orange, no vessels nor strong fibrous textures being ruptured in the process. But when the pedicle of the tumor is reached, a bundle of fibrous material is met, which embraces blood-vessels of some magnitude, therefore a ligature is needed to prevent hemorrhage when the enucleated mass is cut away. A silver-wire ligature is used, therefore it may be safely left in the pedicle, to become encapsuled. The peritoneal envelop of the tumor—a loose bag of considerable capacity—is left in the abdominal cavity, where it gradually shrinks, but never becomes wholly obliterated. It needs little nourishment to sustain its vitality, and that can be obtained from its connection with the pedicle, and through absorption. The large surface from which the cyst has been taken, is not traumatic in the full sense of the term, and it exudes very little plastic material.

Enucleation is only to be performed when extensive adhesions prevent the removal of the entire tumor. When ordinary ovariotomy can be successfully performed, there is nothing to be gained by enucleation. I have found that in polycystic and complicated cases, enucleation can not be executed without leaving ragged patches, which create subsequent mischief.

The most difficult and responsible part of ovariotomy is embraced in the after-treatment. As soon as the patient comes out from the influence of anæsthesia, which has been prolonged but not profound, she exhibits great prostration, and soon complains of pain. It is not well to exhibit stimulants, lest vomiting, which threatens, be hastened. Pieces of ice may be swallowed every few minutes to refresh the patient; and the hypodermic use of morphia allays pain. Iced table tea may be swallowed in the course of four or five hours after the operation.

On the second day a tablespoonful of hot gruel, or hot soup, may be given every three or four hours, and ice-cream, iced milk or champagne between. As a rule, nutriment should be taken very hot or very cold. If the stomach be irritable, milk porridge and beef tea may be administered *per rectum.* Substantial food in satiating quantities is to be given after the fifth day, or as soon as circumstances seem to permit.

The acme of danger is reached on the third day, and passed on the fifth. The ninth and twelfth have been called critical days, but not with much reason. At any rate, if a patient survive the twelfth day without any untoward symptoms, she has passed nearly all danger. Patients have died as late as the thirtieth or fortieth day, but from complications not often existing.

The patient may not be able to urinate the first day succeeding the operation. If not, a catheter may be used. The bowels need not be evacuated for several days succeeding the operation, therefore laxative or cathartic medicine is seldom required. An opium suppository in the vagina, or enemas of laudanum and starch allay pain.

It is not unusual for a woman who survives the removal of one ovary, to bear children afterwards if she has not met with "the change of life;" but if both ovaries be removed there is never afterwards a menstrual show. However, the character of the woman is not otherwise radically changed.

UTERINE TUMORS.

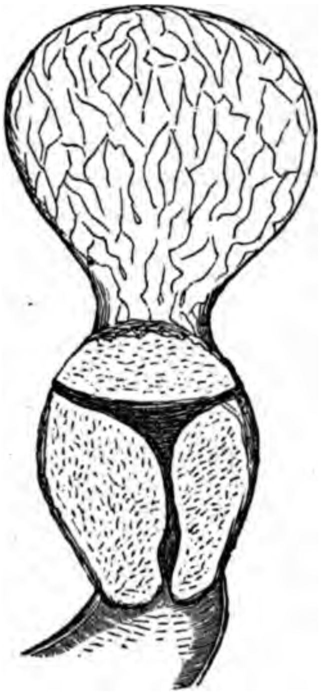
The uterus, from causes not well understood, is exceedingly liable to have tumors developed either upon its inner or outer surface, or in the dense tissues which make up the walls of the organ. The morbid masses so frequently have fibrous material in their structure that they have been denominated *fibroids,* or *fibromata.* Those which spring from the outer surface of the organ, and are necessarily covered with peritoneum, are very properly called *sub-peritoneal* uterine fibroids; those springing from the inner surface, and have for their covering the lining membrane of the organ, pass as *sub-mucous* fibromata; and those which develop in the central portions of the womb, are designated *intra-mural* growths.

Tumors which have their origin near the external and internal surfaces of the uterus, and consequently experience little resistance to rapid development, at length become pendulous or pedunculated, and assume a polypoid form. A tumor starting near the outside of the organ develops into the abdominal cavity, and does not of necessity disturb the form and functions of the womb; a morbid mass commencing its evolutions just beneath the lining of the uterine cavity, either develops into a polypus, or becomes enucleatable material close to the mucous surfaces of the organ; but the interstitial or intra-mural growth transforms the entire uterus into a fibrous mass, and often attains monstrous proportions. This is a true uterine fibroid, for the tissues of the organ are converted into morbid fibre, and the mass becomes somewhat like a hypertrophied uterus, the original constituents of the womb passing through the phases of morbid action until they are neither separable nor distinguishable from tumor-material.

A sub-peritoneal tumor can only be reached by opening the cavity of the abdomen; a polypus may be removed from the uterine cavity after dividing its pedicle; a sub-mucous tumor, projecting into the cavity of the womb as a distinct morbid mass, may be enucleated; and the true fibroid is to be reduced in size by establishing *atrophy*.

An extra-uterine tumor, or sub-peritoneal fibroid, is liable to be mistaken for ovarian disease. Many an abdomen has been opened by the ovariotomist with the expectation of finding cystic disease of the ovary, and then the ventral incision closed again as soon as the true nature of the difficulty was discovered. An extra-uterine tumor may be years in reaching the size of an orange, or in attaining dimensions which are discoverable. A woman may bear several children while the tumor is attaining a size which slightly bulges the hypogastrium. An ovarian cyst develops rapidly; it first appears in the right or left iliac region; is movable from side to side as if unrestrained by any rigid attachments; and generally exhibits a yielding nature, as if composed largely of fluids. An extra-uterine tumor is firm, and occupies the median line. With one hand manipulating a sound, and the other upon the hypogastrium, the tumor and the uterus can be made to appear united or intimately related; and it is rare that a sub-peritoneal uterine fibroid can be moved from side to side without dragging the womb with it. After an extra-uterine tumor has attained great dimensions, it appears more like an ovarian cyst, though the time occupied in its growth constitutes a diagnostic circumstance of value. An exploring needle may be made to reach the deeper parts of the tumor, and thus it can be determined whether a solid structure or a cyst has been penetrated. Such an exploration is justifiable in doubtful cases, for it is not a dangerous proceeding. I have sent an exploring needle into a tumor to the depth of five inches, and did not produce much pain nor excite inflammation. If the needle goes into a solid tumor, it is fixed and rigid; if it plunges into a cyst, its entering end moves about freely.

FIG. 194.



Sub-peritoneal uterine fibroid.

A sub-peritoneal tumor, when diagnosed as such, is to be let alone until it becomes so large that it is unsightly and inconvenient, and obstructs the functions of the abdominal viscera by mechanical pressure. As an extra-uterine fibroma sometimes proves fatal through causes just mentioned, it becomes justifiable, in some cases, to perform gastrotomy, and attempt to remove the mass. If the adhesions be found unimportant, after the abdomen has been opened along the median line, as in ovariotomy, and the pedicle can be ligatured, the operation is not essentially different from that instituted to remove an ovarian cyst. But, should the tumor have no pediicle, and connect extensively with the uterus, enucleation should be considered. If that be practicable, it may be executed at once. The peritoneal covering of the tumor might be incised for a few inches, and separation, by cleaving it from the tumor, be carried into effect. In disengaging the tumor from the uterus, some vessels may need ligaturing, though their division with scissors might be all that was required to prevent bleeding. These tumors usually have a capsule which readily cleaves from the peritoneal envelop. However, when the tumor is lobulated, and has cystic disease complicated with it, enucleation is generally impracticable.

In the event that a removal of the tumor be not justifiable, after it has been explored, the surgeon has no recourse but to close the abdominal incision, and treat the affair as an abandoned ovariotomy case is managed. A laudable attempt was made to radically cure the disease, but unforeseen complications rendered the efforts of the surgeon futile.

If the tumor be removed, drainage should be established through the peritoneo-vaginal septum, as in ovariotomy; and in the advent of dangerous symptoms from septicæmia, the abdominal incision may be re-opened, to allow a discharge of pent-up fluids.

As the pedicle of a sub-peritoneal uterine fibroid is too short to clamp, it should be secured with silver ligatures, and the ends of the wires cut and turned into the stump. These ligatures will remain in position during life, and create no disturbance.

Sub-mucous or intra-uterine tumors present more varieties than the sub-peritoneal growth; they may be in the form of polypi, or morbid masses imbedded in the walls of the organ, though presenting a surface or developing just beneath the mucous lining of the uterine cavity. A polypus of the womb may commence in the *os* or *cervix uteri*, or spring from the borders of the deepest recesses of the organ.

A tumor as big and as round as a marble may exist in the cavity of the womb for years without its presence being known. A woman may go through several pregnancies successfully before the tumor produces an appreciable derangement. However, the size of the morbid mass will at length encroach upon the intra-uterine spaces, deepening and widening the organ, until hemorrhage, miscarriages, prolapsion, and suspicious discharges, call for explorations which lead to an understanding of the difficulty.

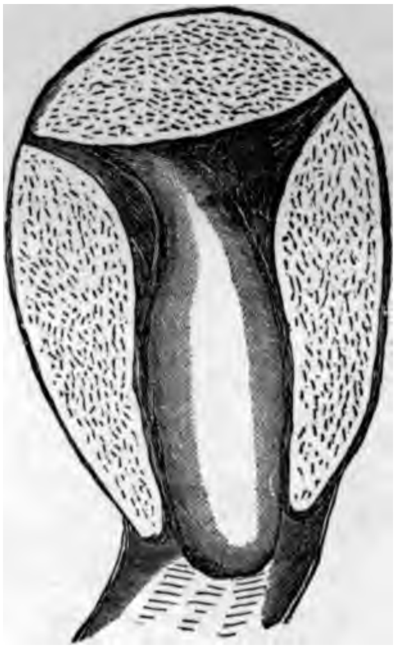
The introduction of a sound into the uterine cavity measures the depth and other dimensions of the organ, and detects the presence of abnormal growth. If the os and cervix be too narrow for explorations, the calibre of those passages may be enlarged with sponge tents, or, what is better, with Molesworth's "Climax dilator." After dilation has been effected, the neck of the womb may be seized with vulsellum forceps, and dragged down to a convenient position for a more thorough intra-uterine examination.

The spherical tumor alluded to, develops in the direction of least resistance, and, consequently, descends until it reaches the vagina, and possibly projects through the vulva. And as it increases in size it alters in shape—its neck shrinking to a pedicle, and its lower end enlarging into a protuberant mass. But it never attains this form without producing hemorrhages, and other symptoms of more or less value in a diagnosis.

The attachment of a uterine polypus at its base is generally larger than its pedicle. This is to insure a good hold, and to secure vascular supplies. In some instances the footstock is small and the pedicle attenuated, while the lower end bulges like an old-fashioned glass bottle, and has a similar indentation in its bottom. Such a tumor may fill the vagina, and the central depression lead to the mistake that this cavity is that of the distorted uterine cervix. During the development of a uterine fibroid of the polypoid variety, there are likely to be periods—possibly menstrual—when there will be bearing down pains and efforts to expel something from the pelvic cavity. These signs may excite the suspicion that a miscarriage is taking place, and lead to unjust criminations. Occasionally a polypus will be cast off during these expulsive efforts, and the patient sink with hemorrhage and shock, or happily recover. Very rarely uterine polypi have disappeared spontaneously, or passed off unperceived. In one instance of my experience a polypus as large as my fist came away with a placenta after parturition. Many cases are reported of women having died from exhaustive hemorrhages, and the true cause of the floodings was not suspected until it was revealed by an autopsy. Vomiting is a symptom of uterine polypus, but as this is an attendant of pregnancy and many other visceral disorders, its diagnostic value is not of much importance.

The uterine contractions caused by the presence of a polypus, may produce inversion of the womb; and if that state exist for some time, such changes take place in the parts implicated that considerable acumen is necessary to detect at once the real condition of things. At the time of inversion the polypus may become disengaged from its attachment, and the inverted uterus be afterwards mistaken for the polypus. The hemorrhages and discharges of an inverted womb, and those produced by the presence of polypi are much alike; and the external aspects of the tumors are somewhat the same. To make a differential diagnosis, a catheter is to be carried into the bladder and a finger into the rectum, and the two then moved so as to discover if the uterus be between them. In a recent case of inversion following delivery, a detection of the true state of affairs is comparatively easy; but in a chronic state of inversion brought about by a polypus, the absence of an intervening body between a sound in the bladder and a finger in the rectum, is pretty conclusive that the womb has been turned inside out, and the tumor in the vagina and vulva is the inverted organ. While the uterus is attempting to expel fibrous tumors which are not polypoid in character, the womb is sometimes inverted.

FIG. 195.



Polypus of the womb.

A polypus of the womb which ordinarily projects into the vagina, and is therefore easily manipulated, may recede within the cavity of the organ and become difficult to diagnose. The sensation which a uterine polypus imparts to the finger is that of a fluctuating body, whereas on dissection it is generally found to be homogeneous.

The removal of uterine polypi is accomplished in various ways. It is often practicable to throw a noose of wire over them, which by twisting or other means of tightening, may be made to effect strangulation. This is the old method and now supplanted by more approved plans. It is not always easy to carry a noose over a uterine polypus; the double canulas and ecraseurs invented for that purpose often fail to accomplish what was intended for them to do.

A loop of wire which will spring into a ring can generally be pushed over a polypus, but it must be borne in mind that the manipulation can be greatly facilitated by grasping the tumor with vulsellum forceps and dragging it very low in the pelvis. I have thus brought a polypus through the vulva, so that the trouble of lassoing it was not great. But when the polypus is dragged very low in the pelvis, it may be excised with strong scissors which are curved at the points.

The polyptrites invented to excise uterine polypi need not have a place in the "gynæcological bag" of any operator; but a supply of long, straight and curved scissors is never useless material in a surgeon's *armamentaria.* It is often necessary to dilate the os uteri or to incise the cervix with scissors, before a polypus can be excised and removed with facility.

The galvanic wire cautery is with some operators a favorite method of removing uterine polypi, but I prefer other means which are less troublesome. Besides, it is not always possible to command a battery of proper power at the time and place the instrument, with its complicated appurtenances, may be needed.

Removal of a uterine polypus by avulsion is sometimes practicable; and it is a very efficient method. The tumor is seized as high as possible, with a strong vulsellum, and then twisted until a moderate dragging force will dislodge the morbid mass. In some instances the pedicle yields, leaving the base; and in others the base is wrenched from its attachments. I have a strong vulsellum, with three curved claws in each blade, which I use for this purpose.

A polypus strangulated with the ecraseur, or cut through at its neck with the galvanic cautery, should be dislodged at once, or as soon as practicable, or the dead mass may produce pyæmia and dangerous complications. Death frequently followed the older methods of destroying uterine polypi; but when removed by avulsion, or excised with scissors, the after complications are rarely severe.

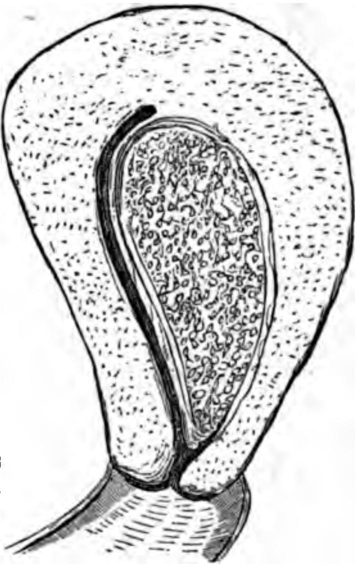
The hemorrhage following the removal of uterine polypi is commonly impressive, but always controllable. The ordinary tampon will generally arrest the hemorrhage; but if it does not, pledgets of lint, charged with a styptic, may be carried into the uterine cavity, the first introduced resting upon the bleeding surface. In the course of thirty-six hours, the wads of lint may be removed, an instrument like a dentist's drill being employed to entangle and dislodge the deeper layers.

During the period of recovery the patient should be kept quiet in a recumbent position, and treated with the attention due a woman who has recently undergone a serious surgical operation. The diet should be sustaining, but not disturbing; and the bowels should be moved with as little effort as practicable.

It has been supposed that a uterine polypus can not be radically cured,—that a tendency exists for a renewal of the growth; but there may have been some misunderstanding about this matter. When a second polypus appears, the tumor does not necessarily spring from the stump or base of the old polypus, but is altogether a new morbid development. A uterus which will give rise to one polypus is more likely to originate another than a womb which has always remained sound. A person who has one wen upon the head is likely to have several others; yet a small proportion of all mankind have cystic tumors of the scalp.

Sub-mucous tumors of the womb may be single or multiple, and develop indefinitely as to size and numbers. Indeed, a tumor within a single capsule may embrace several small and distinct tumors, and thus be a compound or conglomerate morbid development. An uncomplicated tumor beneath the lining of the cavity of the womb, and embedded in the uterine walls, is called a fibroid, though its exterior be capsulated, and its interior largely made up of plastic and granular matter. There may be an abundance of fibrous material in the constitution of such tumors, and some nucleated cells. M. Lebert called morbid masses of this kind "fibro-plastic," though they vary so much in character that no term is comprehensive enough to cover varieties. A spherical tumor commences beneath the sub-mucous tissue, and instead of pushing into the uterine cavity and becoming pedunculated—a polypus—it encroaches upon the solid structure of the womb, and causes enlargement of the organ. Such a growth is not very disturbing in its development, yet in time it may provoke hemorrhages, and otherwise prove annoying. A tumor of this kind may exist for years without its presence becoming known. In fact, it requires a careful exploration of the uterus to determine what may be the disturbing element. However, the sound may be made to ascertain the depth of the womb, and to locate the tumor by the distortion it produces in the uterine cavity. In diagnosing the tumor it is essential that its location be clearly made out before any operative procedure is instituted for its removal. It may be necessary to dilate the uterine cervix with sponge tents, or with Molesworth's dilator. After the cervix uteri is well opened, and the organ is dragged downwards with vulsellum forceps, the finger may be used to explore the site of the tumor. If it be ascertained that the tumor is enucleatable—and tumors of this kind generally are—the operation for removal may be undertaken at once. This is performed by first incising the capsule of the tumor where it projects into the uterine cavity. A long and slender, blunt-pointed bistoury or hernia knife may be employed to incise the mass. One long incision, a quarter of an inch in depth, may do as well as multiple cuts in different directions. No hemorrhage of any account attends the incision; or, if it does, the uterine cervix may be tamponed with lint. The incision interferes with the nutrition of the tumor, and provokes the uterus to attempt to expel the mass by contractions. If no effort of this kind is made on the part of the womb, an expulsive action may be incited by large doses of ergot. After two or three days have passed from the time of the incision, the process of enucleation may be undertaken. This is executed with a variety of instruments, every operator having a way of his own. I have employed the elevator in a case of trephining instruments, and a hand gouge belonging to a carpenter's

FIG. 196.



Encapsuled tumor of the uterus.

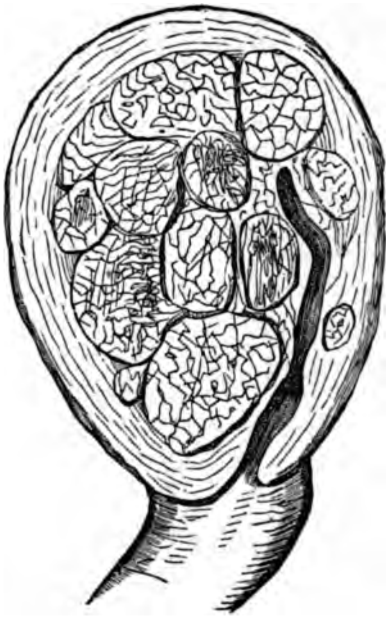
set of tools. And I have bored into the tumor with a hard bit, and employed a screw extractor to drag the morbid mass from its bed. As soon as the tumor is partially disengaged from its original position, it may be seized with toothed forceps, and removed altogether. The mass should not be left in the uterine cavity to decompose and endanger blood poisoning. Any considerable hemorrhage is to be arrested by packing the hollow left by the dislodgment of the tumor with pledgets of lint soaked in perchloride of iron as a styptic. In a day or two the wads of lint could be safely removed, and the free discharge following their removal would be a guard against pyæmia.

Sometimes it may be necessary to incise the cervix uteri with scissors, to make room for the delivery of large tumors. Three or four cuts, radiating from the os tincæ, will do. While the operator is dislodging the tumor by the enucleating process, an assistant should, with hands on the hypogastrium, press the uterus downwards. After a tumor is once enucleated, and the immediate effects of the operation are survived, the period of recovery is not tedious, and the womb gradually returns to its normal size and condition.

A compound or conglomerate fibroma is not so easily disposed of as a simple tumor, from the fact that all compartments of it can not always be assailed at once. The symptoms of such a morbid state are hemorrhages, hypertrophy of the uterus, pelvic disorders, and a uterine cavity from three to six or eight inches in depth. The use of the sound as a feeler discovers a knobby condition of the uterine cavity, and not one prominent swelling, as in the single fibroid. The diagnosis may be rendered more distinct by dilating the os uteri, and dragging the womb low in the pelvis. The inside of the organ can then be explored with the finger, or with short instruments that give clearer indications than a sound.

The diagnosis of a multiple tumor having been established, the process of enucleation is not substantially different from that advised for the management of a single capsuled fibroid. The top of a prominent knob is to be incised, and then the dislodgment left to the action of the uterus. If this organ fails to expel the morbid mass, the work of enucleation may be begun. The removal of one tumor makes way for the dislodgment of others; d with repeated efforts at greater or less intervals, the entire t may be broken up and discharged. It may be difficult to determine when all are dislodged, but when the womb returns nearly to its normal size, and no disturbance of the organ exists, the process of avulsion may be deemed complete. It is a notable fact, that when the capsule of one of these multiple tumors is well incised, the contents of the cyst tend to escape. This arises in part from the contractile efforts of the walls of the womb. Incision, then, is all that may be needed to get rid of the morbid masses.

FIG. 197.



Multiple uterine fibromata.

The most perfect uterine fibroid is where no distinct tumor exists, but the whole organ takes on hypertrophy. The starting point is in the solid walls of the womb, and the growth comes from enlargement of the uterine fibre. The primary center of evolution is usually in the anterior or posterior wall of the organ, so that in the course of morbid development, the uterine cavity is thrown in front or behind the central axis of the womb. In other words, the narrow and elongated canal, which is the distorted uterine cavity, is near one border of the fibroma, and the great mass of the tumor is on the other side of the passage. Commonly the great mass of the growth is in front, or on the vesical side, and the uterine canal is near the rectum.

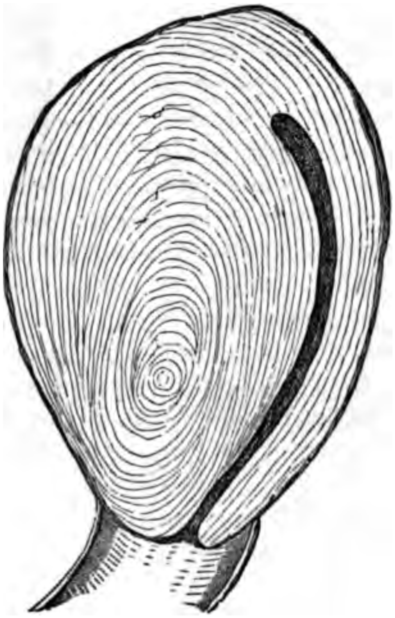
The first prominent symptom of this variety of uterine fibroma, as with other forms of uterine fibroids, is hemorrhage. This may be more or less profuse, and take place at the time of menstruation, therefore its true character may not be suspected until several hemorrhages of an exhaustive nature have occurred, and much useless medication has been tried. The appearance of an enlargement in the hypogastrium is also a marked feature of the disease; but as swellings appear in that region from various causes, the diagnosis is not clear until a sound has been introduced inside the uterus. If the canal of the organ be several inches deeper than it should be, an important diagnostic point has been gained. The top of the tumor occupies a middle region in the abdomen; and when the hand is placed there, and the sound in the uterus is made to press upward and laterally, it will be perceived that the womb alone is involved in the morbid mass. If the tumor was of the ovary, it would be on one side of the median line or the other, and the uterus would preserve its normal depth.

A true uterine fibroid is several years in attaining any considerable size; and during the early stages of the disease the general health is not much disturbed. As soon as exhaustive hemorrhages come on, and the tumor, by its great size, interferes with the pelvic and abdominal functions, it is time that measures tending to relief be instituted. Ergot has been given internally, and introduced hypodermically to check the growth of the tumor and to arrest the hemorrhages. Although important advantages are reported as having been gained by the varied use of ergotine, I have not obtained any satisfactory results from the remedy. There is reason to think that the reports alluded to have been exaggerated. I have known a uterine fibroid to increase steadily in size, though large doses of ergot were given internally one day out of two, and ergotine was hypodermically administered on the alternate day.

The internal use of large doses of the bromide of potassium for several days in succession, has been recommended to reduce the size of uterine fibromata, but no substantial results have been gained by the agent in my hands. I have administered iodoform and several of the iodides, until a condition of iodism existed, yet the fibroids continued to grow.

Failures of various kinds led me to try other means of cure, and those mostly of a local nature. I conceived that a true fibroma had a centre of evolution, which, if attacked with anything potent enough to excite active inflammation, would cease to grow, and perhaps take on a retrograde action. I tried ergotine, perchloride of iron, carbolic acid, and a solution of sulphate of zinc, but the results were not altogether satisfactory. In some instances the hemorrhages were lessened, and the size of the tumors diminished, but in a few cases a dangerous grade of inflammation was provoked. At length I confined my experiments to the local use of the tincture of iodine at full strength. A drachm or two of this fluid can easily be carried to the "centres" of a uterine fibroid, and no unpleasant symptoms be produced. Only a slight soreness is usually excited, and in most instances the patient is able to walk about in a few minutes after the simple operation.

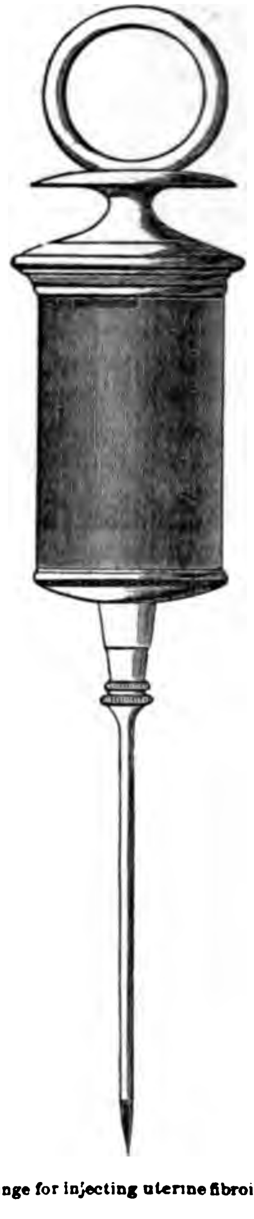
FIG. 198.



True uterine fibroid, with centre of evolution depicted.

The instrument employed to throw the tincture of iodine into the deep structures of a uterine fibroid, is in every respect like a hypodermic syringe, only much larger. The needle-like nozzle is five or six inches in length, and the syringe will hold two or three fluid ounces. The needle is made of steel, and is kept sharp and otherwise in good condition. The syringe is constructed of vulcanized rubber, the piston having a leather packing. The needle is fastened to the syringe with a screw in the nozzle.

FIG. 199.



Syringe for injecting uterine fibroids.

When the instrument is in good working order it is easily used. Before the needle is forced into the substance of the fibroid, the neck of the womb should be dilated, and the thickest part of the tumor determined upon. Of course, no diagnostic acumen could tell exactly where the center of evolution in the tumor was located, but a point approximating this might be judged of. When it is once determined where the fluid should be deposited, the point of the needle may be given that direction, and boldly pushed to the locality. Then the piston of the syringe should be made to unload the contents gradually, while the needle is slowly withdrawn.

Very little shock attends the operation, and not much irritation follows. In the course of a week a repetition of the injection may be instituted; and in the course of two or three months the operator may expect the depth of the womb to have decreased, and the swelling in the hypogastrium to have diminished. And what is more encouraging to the patient, she will have been troubled very little with hemorrhages while the treatment was going on. It may take a year or more to perform an absolute cure, but as improvement is made all the time, the patient endures the treatment without complaint.

Formerly there was no method of treatment for this variety of disease, which I denominate the true uterine fibroid, that promised substantial relief. Now I am persuaded that many of these fibroids may be successfully attacked. As they are not encapsuled, but evolved through hypertrophy of the uterine fibre, there is no opportunity to enucleate them; and no course of constitutional treatment has arrested their growth, or induced retrogression. By the method I have suggested there is a rational hope of curing another of the common diseases of the uterus. Other injections may prove more energetic than the tincture of iodine, in provoking retrogression, but I have found none equally efficient. But whatever be the fluid employed, I am convinced that the needle-nozzled syringe is the instrument to throw the medicinal agent where it may do some good. The operative procedure is simple, and the danger slight. Dilute preparations of iodine impart a greater shock than the officinal tincture at full strength.

CANCER OF THE WOMB.

The uterus is an organ more frequently attacked with carcinomatous disease than any other organ in the body, unless it be the mammary gland: and the morbid action being generally fatal in a few months, and attended with such disgust and distress that however dreadful the disease may be wherever located, its terrors seem to be intensified when the womb is known to be invaded. Although cancerous diseases present varying histological characteristics, and different degrees of malignancy, the mildest forms and phases leave little ground for the indulgence of hope.

The bladder and rectum are contingent organs, therefore the womb can not well be attacked with cancer without the certainty that all the pelvic viscera will be sooner or later involved. If it were a comparatively safe operation to remove the uterus altogether, and an early diagnosis of carcinoma uteri were possible, excision of the organ as soon as it was known to be invaded, might prolong life, and even result in some cures. But, unfortunately, the womb can not be safely extirpated; and an early and undoubted diagnosis of cancer of the womb is rarely attained. Before the nature of the disease is discovered, it may have taken a deep hold upon the constitution, therefore a belief in the local character of the disease in its incipiency, will not aid in its overthrow, for the morbid impression has become systemic before its presence is suspected.

It makes little difference whether the surgeon believes, or does not believe, in the hereditary nature of the disease, except as the positive state of mind on the point may lead to an early suspicion and investigation of a uterine trouble, for the same fatal tendency exists, whether the disease comes for the first time in a family, or has taken off several members in as many generations. Although it has not been determined that cancer is related to any other form of disease, or is interchangeable with some other form of morbid action, it is possible that a morbid taint existing in a family may develop into phthisis in one member, into gastritis in another, into nephritis in a third, into cancer in a fourth, and so on. The introduction of a seemingly unimportant element into a chemical solution, may radically and emphatically change the character of the mixture ; so, in the animal economy, a slight modification of morbid elements may evolve a disease at variance with the original morbid character and tendency.

Cancer of the womb oftenest appears in women between forty and fifty years of age, a circumstance which seems to indicate that the disease was evolved by the vital conditions which exist about " the turn of life " ; or that the vital energies at that period were unable to resist cancerous invasion. I have known carcinoma to attack the uterus of a girl nine years old, and of a woman eighty years of age; and cases are reported which show that no time of life, from infancy to old age, is exempt. The germs of cancer may be always present, as are those of some other diseases, " favorable conditions " alone being needed to fix and develop the mature disease. Probably the best way to escape an invasion of cancer is to keep the recuperative powers of the body in as good condition as possible. One leading reason why carcinoma uteri appears at a period of life corresponding with a cessation of menstruation, may be that the nutritive or recuperative condition of the body is then feeble, or otherwise unfit to resist invasion. Those women who have borne children are somewhat more liable to cancer of the womb than the unmarried and the sterile. This is somewhat at variance with prevailing opinions, yet statistics, observation, and experience seem to sustain the inference.

There is no reliable evidence that cancer of the womb is ever imparted to the male by coition. Probably it is safe to handle cancerous growths which appear upon any part of the body. Possibly a cancerous graft, surgically applied, might take root, and develop, but such proof has not yet been furnished.

It is commonly the case that cancer of the womb extends to the rectum, bladder, and adjacent structures, before the disease proves fatal, yet in its early stages the morbid state may be restricted to even a part of the uterus. It is known that the cervix uteri may alone be implicated for months, for amputation of this part of the organ, when effected, has led to a temporary cure. As a rule, the epithelial variety of cancer attacks the cervix uteri, and the encephaloid species invades the body of the organ. The scirrhus is the rarest form of the disease, and may fasten upon any part of the womb, even involving the entire organ and adjacent structures.

Medullary cancer involves the connective tissue of the womb; its cells, commonly monstrous or abnormal in type, and possessing great reproductive activity, infiltrate the areolar tissue and muscular spaces. As the cell multiplication proceeds, the normal elements of the parts encroached upon become transformed into cancer, or wholly disappear. In time the womb occupies so much of the pelvic cavity that the bladder is crowded upward, the rectum is flattened, and there is scarcely room to insert the finger into the vagina. The deformed os uteri is brought low down, and the orifice is barely recognizable from the nodular and fissured border which surrounds it. The distortion usually occludes the os, yet in rare instances, for a season at least, the canal of the cervix may be held in an unnaturally patulous state. As a rule, a cancerous womb can not be readily moved; a fixed state of the organ is to be regarded with suspicion.

After carcinoma invades the uterus, it may be a year before the true character of the disease is known. The woman may complain of darting pains in the pelvic region, may menstruate irregularly or profusely, and be subject to tired sensations, or feelings indicating vital depression; but, as all these symptoms may exist in women that have no malignant disease, the presence of cancer may not be suspected. It is so common for "would-be gynæcologists" to regard every disorder of the female as evidence of ulceration of the cervix uteri, and to use caustics for the cure of the imaginary disease, that a cancerous state of the womb is likely to be subjected to the same treatment for months after an acute diagnostician would have ascertained the real nature of the disease.

After a fungous mass projects from the dilated os uteri, and bleeds whenever touched, it is not difficult to determine the character of the growth. By this time the patient has lost flesh and

strength, and taken on that straw-color
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character of the malady.

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In an advanced stage of carcinoma u
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naturally escape by the way of least resi

Pain, moderate or the most excruciati
dominating, is characteristic of cancer o
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neutralizes the stupefying effects of the

Iron, arsenic, phosphorus, and perhap
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The odor arising from carcinoma uter
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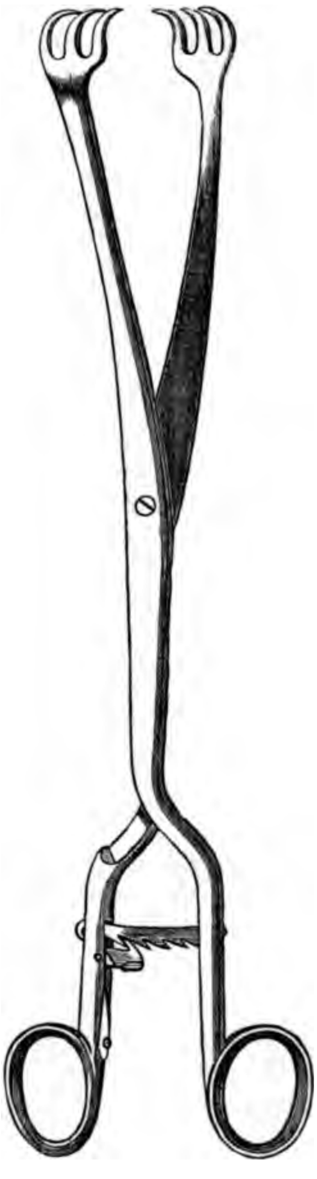
the nose first indicating what may be t
The discharges which issue from the ge

FIG. 200.



Three-toothed vulsellum forceps.

they leave a stain upon instruments of polished steel or silver.

Epithelioma of the lining membrane of the uterine cervix is as common as carcinoma uteri; but the general symptoms of this phase of cancer are not so severe and destructive. The disease may exist for months without involving the deeper tissues of the womb. The *cauliflower excrescence* of the earlier writers upon malignant diseases of the female genitalia, is no more nor less than epithelial cancer of the uterus. A fungous growth projects into the vagina, from the os uteri, and bleeds when touched, though not specially sensitive when rudely handled. Sometimes a fungous excrescence which projects from the uterine cervix, is an offshoot, as it were, from a deep carcinomatous development. If the body of the womb be fixed in the pelvis, and form a projection in the hypogastrium, it is probable that the whole organ is affected with malignancy, and that the excrescence is only a phase or feature of real carcinoma. But if the uterus be mobile, and a finger in the rectum discovers that only the cervix uteri is enlarged, the logical inference may be drawn that a cancroid, or epithelial form of malignancy exists. However, too much encouragement should not be taken from such a diagnosis, for the milder manifestations of malignancy are not unfrequently followed by the worst phases of carcinoma.

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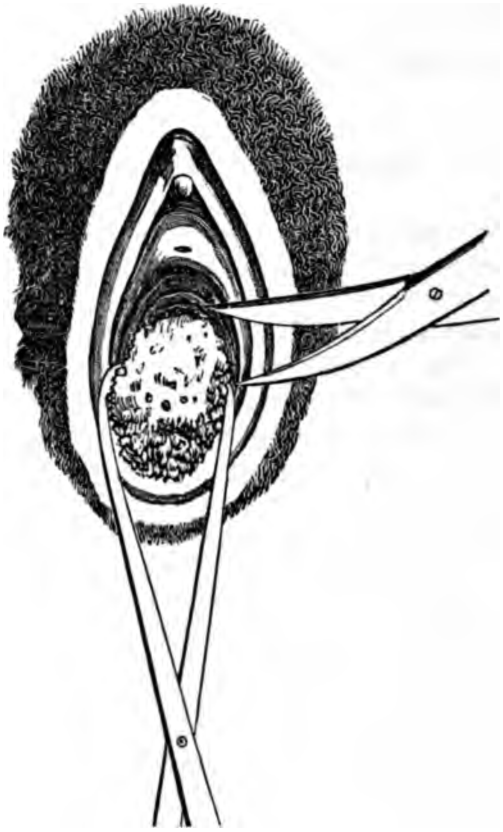
profuse and persistent hemorrhage should follow the excising process, a pledget of lint carrying a styptic may be applied to the bleeding surface, and then a snug tampon employed.

FIG. 201.



The cervix uteri dragged to the vulva, and scissors ready to excise the morbid mass.

In two or three days from the ablating operation, a speculum of the tubular variety is to be carried into the vagina, and so placed that the traumatic surface presents to the mouth of the instrument, or projects into it. This is to be held snugly in place for a half hour, or while moistened chloride of zinc is pushed against the stump with a swab, and time given for escharotic effects. The speculum prevents the caustic from attacking the vagina. Swabs are to wipe all the escharotic away before the speculum is removed. In two or three days a slough, embracing any cancerous tissue that escaped the scissors, will come away.

The stump will then heal kindly, and
no morbid manifestations. Arsenic is
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nutritious diet will aid in the work of
course of a few months or a year, the
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DILATORS FOR THE UTE

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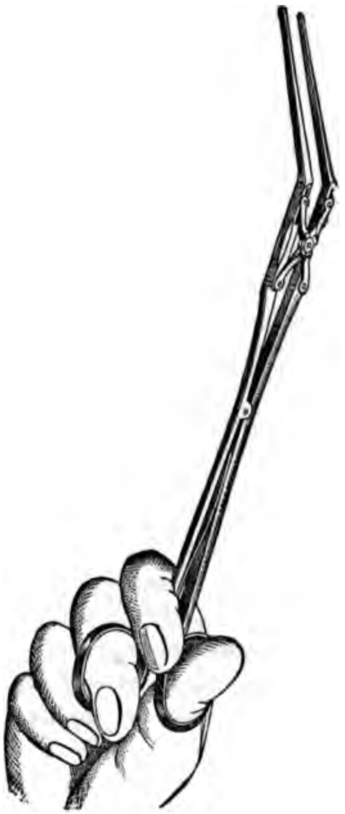
a uterine sound ; and when the depth
the handles are to be closed by the acti
ment which opens the blades and ef
between the handles keeps the blades
with the hand. A peculiar double joi
from point to base while separating.

A uterine dilator is mostly employe
the external and internal os, in order
the menstrual discharge ; and for this
ing than gynæcologists would have us
scribed possesses valuable points. At
improve upon the Ellinger dilator, b
that direction has yet been gained.

It is frequently asserted that sterilit
or contracted state of the uterine cer
ologist knows better. The calibre of

ler than that of the uterine cervix, yet we do not find that gynæcologists are in favor of dilating these passages, or complaining that they are too small.

FIG. 202.



Ellinger's uterine dilator. The instrument is presented top side down, to exhibit the sliding joints.

Incising the border or enclosing ring of the os uteri, has been commended as a method of relieving a narrow canal in the cervix, but this, again, has been over-estimated as a barrier to menstruation, and too often meddled with. During the menstrual act the os uteri is open, and its surroundings soft and yielding. A vaginal suppository containing belladonna will generally overcome undue contraction, and thus do away with indelicate and unnecessary operations upon the virgin womb.

What is commonly called "ulceration" of the os and cervix uteri, is rarely such, but a spongy state of the follicles in the uterine cervical canal. A glairy discharge, which is ropy and tenacious, is the best evidence that such a morbid state exists. A patient with such a condition of the womb suffers fever, backache, debility and irritability. The local difficulty is to be treated by applying nitric acid or strong carbolic acid to the lining membrane of the uterine cervix, once in five or six days. The astringent and caustic is to be applied with a pencil of wood used through a tubular speculum. The stick or splinter of wood may be whittled from pine, and shaped so it shall enter the canal to the distance of three-quarters of an inch or so. The entering end of the caustic-bearer should be the shape of the slightly flexed fore-finger, and smoothly rounded. A brush, swab, or probang, only reaches the os and its immediate surroundings, while the stick, or splinter of wood, just recommended, may be readily carried from a half inch to an inch in depth. As the disease is in the uterine canal, the escharotic should be carried to a depth corresponding with the morbid manifestations.

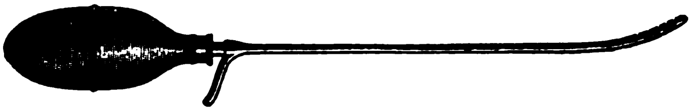
An indurated ring at the lower extremity of the womb arises from chronic inflammation of the lining of the uterine cervix, and is to be dissipated by the use of the pine caustic-bearer. The end of the stick is to be dipped in nitric acid at full strength, and then shaken to get rid of a hanging drop. The pencil is to be left in place a minute or two, that time may be given for the caustic to make a decided impression. The application is not attended with pain, unless the os tincæ be unusually sensitive. The speculum should be so introduced that the os uteri can be plainly seen when the instrument is in place. Valvular specula for vaginal explorations, are in common use, yet tubular instruments of various sizes are cheaper, and just as good for the uses indicated.

Occasionally a real ulcer appears upon the os tincæ, which is plainly visible to a view taken through a vaginal speculum in a good light. The ulcer may extend outward upon the neck of the womb, and within the canal of the cervix to the depth of half an inch. Such an ulcerated surface is to be treated by using caustics in the manner just indicated. The internal use of "acid tincture of iron" will assist in the cure.

Pendulous tumors, which are polypoid in nature, frequently spring from the border of the os uteri or from the uterine cervix, and project into the vagina. If quite vascular, they will bleed when roughly handled. It is a tedious process to remove such growths with caustics, therefore it is generally best to excise them with scissors, or to twist them with forceps and then uproot them by avulsion. They rarely demand the use of an ecraseur.

Much has been written upon intra-uterine medication; and Molesworth has invented an excellent instrument for executing the treatment, yet experience teaches that danger attends the throwing of fluids inside the uterine cavity. Patients have been forced into paroxysms of prostrating pain by the introduction of warm water within the cavity of the womb; and three or four deaths are reported as having suddenly followed intra-uterine medication. When there is a profuse and putrid discharge from the inner uterine surfaces, the temptation to medicate the morbid surface is great. And if the fluid be injected slowly at first, and its effects upon the patient be watched, the plan may be executed without much peril. The best fluid to employ is a very dilute solution of carbolic acid; and the liquid should always be warm when injected. By a combination of tubes and valves in Molesworth's syringe, fluid may be thrown into the uterine cavity and then withdrawn without removing the instrument. After the elastic bulb is filled with the liquid to be injected, the nozzle is to be insinuated through the canal of the neck of the womb, as is a common sound; and then the fluid is thrown in and drawn back several times, to wash and rinse the uterine cavity, then the suction produced by the rubber bulb takes out the medicated wash and whatever animal matter gets mixed with the solution.

FIG. 203.



Molesworth's intra-uterine douche syringe.

In a case of retained placenta following a miscarriage, with hemorrhage, metritis, and pyæmia, it is safe to inject the cavity of the womb with a fluid as hot as can be borne; and the result is generally very satisfactory.

A recently inverted womb is to be returned to its normal state by steadily and persistently pressing the fundus upwards with the fingers while the patient is under the influence of an anæsthetic. A uterine sound is to be employed to carry the fundus upward after it is beyond the reach of the fingers. In a chronic case of inverted uterus, it being no longer possible to return the organ to its normal state, the body of the womb projecting from the vulva may be excised with scissors, or removed with the ecraseur. The hemorrhage may be profuse, but the use of styptics or the actual cautery will avert a fatal issue.

VESICO-VAGINAL FISTULA.

Vesico-vaginal fistula is one of the most unfortunate accidents that can happen to the lying-in woman; and sufferers from such a calamity are exceedingly fortunate that surgery can, at length, restore them to health and comfort.

The condition of a woman with an accidental opening between the bladder and vagina is lamentable in the extreme. The urine is no longer voided by the natural passage and at convenient intervals, but escapes drop by drop through the vaginal outlet, ex-

coriating the vulva, the perineum, the na
faces of the thighs. The clothing about
rated with urine, and a change of apparel
tary relief. The chair sat upon and the
contaminated. A urinous odor is insepa
she is disagreeable to herself and to her a
for society, and an object of deep commis

Surgeons who have hardly passed the
member when nothing could be done to
co-vaginal fistula. But, thanks to Ameri
rance, and skill, the time has arrived whe
need no longer dread the horrors once en
nate enough to receive a laceration of the

The operation for closure of the rent all
mate and successful as any other of an
surgery. The pathology of the disease is
instruments employed in the cure are so
and the operative procedure so clearly de
may succeed at his first trial.

To Dr. J. Marion Sims, more than to
belongs the credit and the honor of devel
vesico-vaginal fistula. His early endea
efforts, and successes (see *Silver Sutures in*
with the interest of a novel. Although
rated by Dr. Sims has been simplified an
and others, the original plan still retains
tures. The metallic plates and perforat
employed, yet the duck-billed dilator, the
self-retaining catheter are not likely to b

Although much skill and ingenuity ha
construction of instruments to facilitate t
sideration, great improvements are still n
best scarifiers, because little bleeding fol
present constructed or fashioned, they fai

Improvements are being made every y
paring instruments. A German inventio
sor-blades at any angle, is now on the m
promises well in some cases.

The delicate tenaculum and the tooth
and holding the paring, are defective. T
be longer and stronger, so as not to tear

callous tissues. The needles vary sufficiently for contingencies and complications, but the needle holders can be greatly improved. The introduction, tightening, and fastening of the sutures also need improvement.

The instruments employed for operating upon vesico-vaginal fistula are made specially for the purpose, and few of them are useful for any other purpose. The scarifiers and needle-holders may be utilized in staphylorraphy, for they are made long and slender to use in deep cavities.

Before describing the method of operating, it may not be amiss to venture an opinion concerning the cause of vesico-vaginal fistula. Dr. Emmet expresses himself as follows:—

"A vesico-vaginal fistula following parturition may be defined as an opening from sloughing into the bladder, resulting from delay in delivery after impaction has taken place.

"The exceptions to this rule are those caused by rapid labor, lacerating the neck of the uterus and extending beyond so as to involve the base of the bladder, together with lacerations at its neck, which sometimes occur on delivery by forceps.

"The accepted teaching, to wait any given length of time after the occurrence of impaction, with the hope that nature may yet accomplish the delivery unaided, is, as a rule, attended with great danger.

* * * * * * * * *

"An escape of urine frequently follows immediately after delivery by forceps, but only as a result of the slough, which had already taken place, and at the time partially detached.

"The only deduction that we can draw from experience is, that the lower the head is left in the pelvis, the greater is the danger, and that less than two hours even is sufficient to cause extensive loss of tissue; also, that the amount of injury is by no means in proportion to the length of labor. Therefore, the only safety consists in as speedy a delivery as the circumstances of the case will admit."

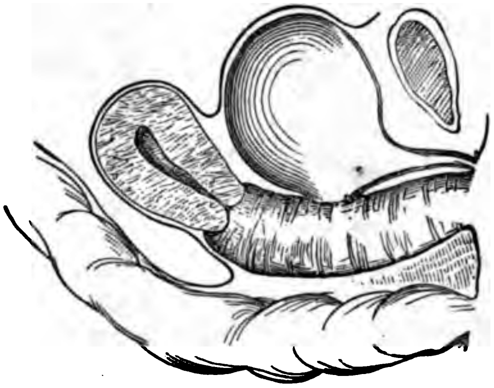
It will be seen by the above that Dr. Emmet regards *impaction* during delivery as the chief cause of vesico-vaginal fistula, and the slough leading to the rent as produced by the pressure. He does not regard the proper use of forceps as a source of danger, but as a means of escape from prolonged or perilous impaction.

While I admit the obstetric forceps may be so recklessly manipulated as to produce rents and sloughs of the vesico-vaginal septum, and other serious accidents to the soft parts, I have never believed that instrumental delivery is as dangerous as "undue waiting." Timid and incompetent parties will stand around the parturient woman for hours after the delivery should be facilitated with forceps; and when despair called for instrumental interference, they were the first, if a gush of urine followed the birth of the child, to cry out that "the forceps did the mischief," though, in reality, the pressure of the child's head against the pubic arch, a fold of bladder being caught between, was the true cause of the destructive slough. I will add, besides, that an over-distended bladder is frequently the cause of the "impaction," or of the vesico-vaginal septum becoming destructively pinched. I never meet with a case of vesico-vaginal fistula without asking the sufferer to state how often the urine was evacuated during the unfortunate labor. In one instance the woman said that for twenty-four hours preceding the delivery she passed no water, and the doctor did not use a catheter nor even inquire in regard to the condition of the bladder. A similar story has been told in several instances, therefore I incline to the opinion that over-distention of the bladder is a frequent cause of vesico-vaginal accidents, and that the obstetrician is sometimes culpably negligent of this important part of his duty. In prolonged and unsatisfactory labor it is not uncommon to administer ergot. This drug may contribute indirectly to a vesico-vaginal fistula, by contracting the sphincter vesicæ, and thus overcoming the patient's ability to void the urine.

The examination of a patient laboring under vesico-vaginal fistula, does not always reveal the same abnormal conditions. There may be difficulty in discovering a small fistula; and its existence would not be suspected were it not for the urinary excoriations and phosphatic deposits in the vaginal folds. But, where the loss of tissue has been extensive, the posterior wall of the bladder protrudes into the rent, exhibiting a deep redness and a tendency to bleed. The edges of the fistula, if weeks or months have passed since the slough took place, are found in an indurated and cicatricial state. Sometimes a careful exploration with the finger is needed that the knowledge of parts thus obtained may be used in a subsequent inspection. The callous border alluded to above must all be pared away in order to reach healthy tissue which only can be depended upon for a union.

A good light is absolutely necessary for operating upon vesico-vaginal fistula. Sunlight in the middle or earlier part of the day is desirable; and the patient must be arranged on a table so as to secure the advantages of the light. The passing of a cloud over the sun will sometimes arrest the manipulations of the operator. The operation under favorable circumstances severely taxes the patience, dexterity, and ingenuity of the surgeon. Although made to appear very simple and easy by a set of diagrams, the operative procedure presents difficulties and complications which can not be fully provided for until encountered and studied. A case should be examined, if practicable, before the day set for operating, yet I have operated successfully in a few minutes after seeing the patient for the first time. However, I prefer a preliminary examination, which enables me to prepare for peculiarities and possible contingencies. The patient should have the bowels moved by cathartic action the night preceding the day set for the surgical operation. The patient should have a female attendant, and the surgeon needs two or three medical men as assistants.

FIG. 204.



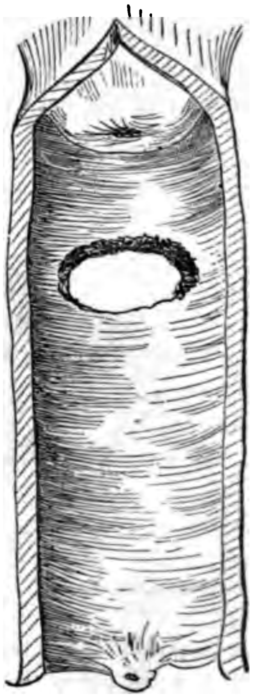
This diagram represents a vesico-vaginal fistula, or an open communication between the bladder and vagina.

The instruments needed are usually cased in a "set," and consist of a duck-billed speculum or dilator, scissors of various curves, several tenaculums, a knife shaped like a tenotome, but with a long shank, double-edged and angular scarifiers for emergencies and special purposes. A blunt hook is useful to press upon the yielding tissues while the needle passes, and to disentangle the suture strands. An instrument shaped some like the handle end of a grooved director and called a "feeder," is indispensable in helping the suture into place after the needle has passed. Two pairs of long forceps—one of which may be needle holders—are needed to bring the two strands of a suture together and fasten them with a twist. Several probang sponges, improvised by tying bits of sponge to ends of sticks, are necessary in freeing the wound from blood during the freshening process, and sometimes while sutures are introduced. A common female catheter is useful in the urethra and bladder while the fistula is operated upon. It serves to push back and hold out of the way a prolapsed vesical wall. A variety of needles should be at hand; and several yards of No. 28 or 29 wire known to be drawn from virgin silver. Common wire drawn from coin is no better than iron or copper.

The patient is to be dressed in night-gown and drawers, and covered with a sheet. She is to rest on a table four feet long and two feet wide, and about thirty inches high. The table should be covered with folded quilts to form a comfortable bed; and an oil-cloth cover should protect the bedding. Several pillows will be needed, one to be placed between the knees if necessary.

The patient is to recline on the left side, the thighs are to be flexed on the abdomen, and the nates, turned to the best light, should rest near the end of the table. The body of the patient ought to be rolled towards the prone position, with the head bent towards the chest. The female attendant tucks up the night dress so it shall not get soiled, and arranges the sheet to prevent needless exposure.

FIG. 205.



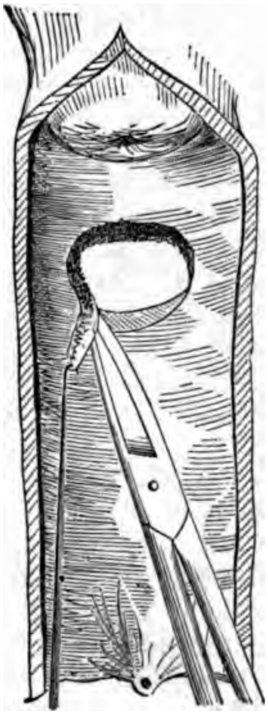
Vaginal aspect of the fistula.

Generally the patient will endure the operation without an anæsthetic, especially if she take a dose of chloral or morphia, or a drink of whisky. However, I have operated upon patients who could not be controlled until they were moderately chloroformed. Profound anæsthesia should not be produced, as the operation is likely to last an hour or two.

The operator sits upon a stool, having his instruments spread upon a tray conveniently near. A basin of cold water is placed within reach. The first instrument used is the duck-billed speculum, which is introduced into the vagina, towards the rectum, and then given to an assistant, who is to hold it steadily as the surgeon directs. The female catheter carried through the urethra into the bladder is, as has been said, a useful instrument to press the edges of the fistula into view, and to hold away prolapsed vesical folds.

The first step in the operation consists in denuding or freshening the border of the fistula. This is to be executed by seizing the edge of the fistula at some point with a tenaculum having a sharp hook, or with long, slender forceps, having sharp teeth, and removing a substantial strip or paring clear around the fistulous opening, with a delicate knife or curved scissors. Just abrading or scarifying the edge of the fistula is not enough, but the cicatrose border should be thoroughly removed. If the freshening can be accomplished by taking off an unbroken strip, the denudation is probably complete. If the paring breaks while it is being removed, a new one has to be started just where the other stopped, and this has to be done on a surface bathed in blood, therefore the operator must be on his guard against deception. The denudation should reach the mucous lining of the bladder, and involve the border of that membrane.

FIG. 206.



Freshening the fistula with scissors.

While the denuding process is going on, the blood and fluids must be removed with the probang-like sponges. A small dental or laryngeal mirror is sometimes useful for the inspection of a freshened surface. If a point bleeds persistently, it may be pinched with forceps until the hemorrhage subsides.

The second step in the operation consists in the introduction of the suture-wires. Needles are employed to carry the metallic

threads, and each suture is distinct from
interrupted variety. There should be
inch, therefore they are less than a quart
a third of an inch intervene, the urine
prevent union. All the suture wires m
any are fastened, therefore it requires c
the last to hold the strands aside, and to
cable confusion. An assistant can tie e
a string, so that the operator can, when
set separated by a knot. The assistant
to one side, or away from the operator.

In my later operations I have used the hollow suture bearer, going through both borders of the rent before withdrawing the needle; and then tightening and fastening the suture as soon as it is in place. I begin in the middle of the wound or chasm and work each way, using the first suture ends to drag the wound into view.

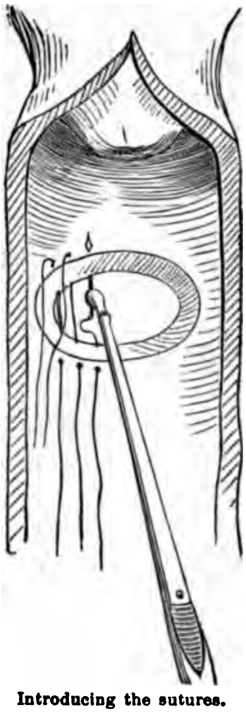
Different operators have their own ways for introducing the suture-wires. And as I aim to avoid confusion, by describing several methods, I will only describe my own. I arm a needle with a silver thread (wire) as if it were silk or hemp; and then twist the short end of the loop around the other, close to the eye of the needle. The shoulders of the loop are pressed into the grooves of the needle's eye, so as to offer little resistance to the passage of the eyed part of the needle; and
the twist of the loop is not a serious obs
of the suture. The silver wire attache
can be handled with rapidity; and kinks
by the exercise of a little care. It is wel
armed and ready for use at the commen
A piece of wire fifteen inches long will

The introduction of the suture wires is a tedious and particular part of the operation, for every manœuvre is to be executed with care and deliberation. Haste would be attended with loss of time and imperfect work.

No form of needle is suited to all cases. I prefer Emmet's for most cases. The eye is so deeply counter-sunk that the loop of suture is well covered. If a needle be brittle, it is sure to break.

The forceps for grasping and passing the needles should be unyielding in their grip and otherwise reliable. The grasping surfaces are grooved so as to hold the needle at any angle.

FIG. 208.

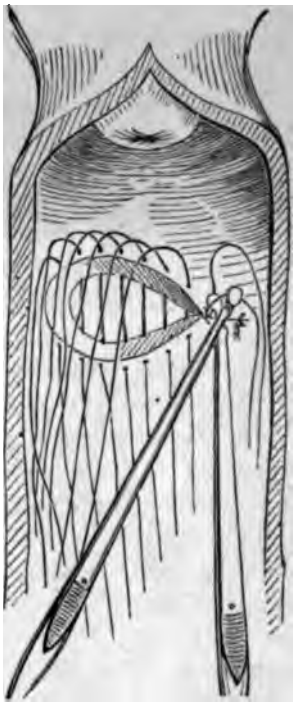


Introducing the sutures.

The needle is made to enter the nearest lip of the fistulous opening, about a quarter of an inch from the freshened edge, and *pushed* onward, the point of the needle emerging in the rent close to the mucous lining of the bladder. As soon as half the needle thus appears the forceps grasping it are made to let go the part near the eye, and to re-grasp the emerging part, when the passage of the needle is secured by a *pulling* force exerted in about the same direction the needle has already taken. Enough wire is drawn in to allow the forceps to be changed from the pointed part of the needle to the eyed part. The forceps having thus been changed, the needle is made to enter the distal side of the rent at a point corresponding to its emergence from the proximal side, and having transfixed the other lip of the fistula, it should be made to emerge at a point corresponding with the point of original entrance. The forceps now are made to let go the eye end of the needle, and having re-grasped the protruding part back of the point, the needle is pulled on through, care being taken not to tear the transfixed tissue. After the needle is wholly passed, the wire is to be carried into place by gentle strokes of the "feeder," which acts like a movable pulley, and prevents any strain on the edge of the wound the needle has made.

The third step in the operation consists in fastening the sutures, a process which necessarily approximates the edges of the fistula. Different operators have their own ways for executing this part of the operation, but I will describe only my own. I use two pairs of long forceps—one being the needle holders—to grasp the strands of each suture, draw together that part of the fistulous opening which they bear upon, and twist them around each other to constitute a fastening which is better than a knot. Each forceps takes the place of a finger and thumb; and a half turn can be given to the strands at every grasp. Care must be exercised that the wound be snugly closed before the first half turn is made, and that this imperfect fastening does not slip or yield. The forceps have to change strands at every repeated half turn. Two or three full turns secure the fastening; and then the untwisted ends may be clipped off with scissors. One suture after another is to be tightened and fastened as is the first. When all the sutures are complete, the sharp ends of the clipped wires may be bent down with forceps to obviate jagging the vaginal walls. It is to be remembered that the two end sutures should be a little outside or beyond the extremities of the fistula.

FIG. 209.



Closing the fissure and fastening the sutures by the twisting process.

The self-retaining catheter is introduced as soon as the sutures are fastened; and the patient is then transferred from the operating table to the bed, where she is to recline upon her back for ten or fifteen days. Opiates should be administered in proper doses to prevent the bowels moving until the sutures are removed, which may be on the ninth, tenth, or eleventh day.

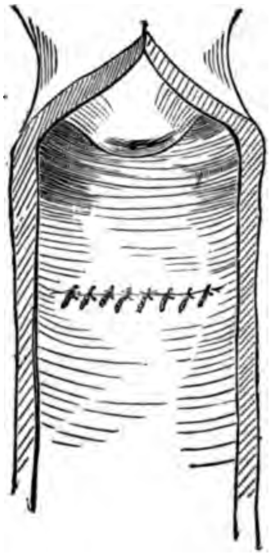
The patient is to be fed on a light yet nourishing diet; and made as comfortable as possible during the period of confinement.

A common porcelain soap-dish is useful to catch the urine as it drips from the catheter. This vessel should be emptied often enough to prevent overflow. The limbs of the patient may be moderately flexed, and supported at the knees with a pillow. The restricted position upon the back for ten or twelve days is rather irksome, yet most patients bear the monotonous attitude without murmurs.

Two sigmoid block-tin catheters are needed, one being used a few hours at a time, and cleansed when not in use. If a catheter becomes clogged with concretions, the urine accumulates in the bladder, and produces a dangerous strain upon the sutures.

There is an erroneous opinion that silver sutures will not ulcerate out, but experience proves that they will cut their way through the flesh as fast as silk, if much tension is exerted upon them. In the after-treatment, then, is embraced a careful watching of the catheter, to see that nothing prevents a constant emptying of the bladder to obviate strain on the sutures.

FIG. 210.



The fistula closed.

During the healing process the vagina may be douched with a syringe every day; and the surgeon may examine the wound every two or three days to ascertain if every thing be going on well. If any urine escapes between the sutures, the operation can only prove a partial success. However, it can not be determined, until the sutures are removed, to what extent the operation has been a success.

If every thing has apparently progressed favorably until the ninth or tenth day, the sutures may be cut and removed. For this last step in the operation the patient is again to be placed upon a table in a good light; the vagina is to be dilated with a duck-billed speculum, and the sutures are to be cut and removed, one after another. The nearest side of the loop is to be cut with scissors, then the forceps are made to grasp the knot, and by a rotating movement, with slight traction, the loop of wire is removed. The gentle force in a downward direction

tends to hold the edges of the wound
comes away. In a very obese patient
sutures, and it remained several mon
comfort.

The next day after the sutures are d
be moved with an efficient cathartic.
in place a day or two afterwards, whe
begin gentle exercise. In a few weeks
and the functions of the body are full

It may be remarked that an opera
vaginal fistula should not be undertak
is likely to intervene during the heal
intimated, the operation, to prove su
conditions as possible. A movement
healing process might not result disa
gency should be avoided, if possible.

In some cases the cicatricial tissue f
nary excoriation, draws the neck of t
and so firmly binds it there that the
issue is to freshen a surface on the rec
the anterior border of the vesico-vag
these freshened edges, leaving the cer
bladder. This operation I have exec
no trouble arose from the mal-positi
of the three had ceased to menstruate,
was a show of sanguineous urine fo
days. In one of the three cases the p
regard to the nature of the operation
forty years of age, and the mother o
would not probably find much fault i
with the cause of her sudden sterili
upper extremity of the vagina was no
tercourse.

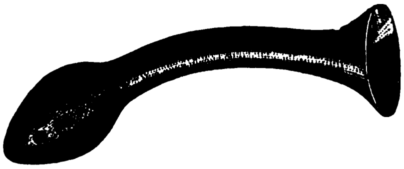
In the case of Mrs. S. I found a
was left behind a closed perineum; a
and loss of the entire urethra. The l
cated accident was uncommonly prol
maining impacted in the lower pelvic
hours. In a day or two after deliver
fæces came through the body withou
that the urine dribbled involuntarily.

tention being called to the difficulty, he discovered that the perineum was ruptured, and the recto-vaginal septum to the depth of two inches; and that the urethra and anterior portion of the floor of the bladder were wanting, all having disappeared in a slough.

Subsequently an operation was made upon the perineum which closed the chasm, but a large recto-vaginal opening was left above the line of union, and nothing advantageous was gained, for the fæces passed into the vagina through the unnatural opening. In fact, the operation never should have been undertaken. In such cases the rent in the recto-vaginal septum is to be closed at the same time the ruptured perineum is joined. It is so difficult to close a recto-vaginal fistula, that some surgeons have recommended cutting through the perineum as a beginning of the operation. I do not regard such a step as necessary. In the case I allude to the recto-vaginal fistula was joined before the urinary difficulty was touched. This part of the operation was undertaken in accordance with an earnest request of the patient.

The next step was to form a new urethra, and to close the vesico-vaginal fistula. The first step was to freshen two parallel tracks on each side of the original roof of the urethra, which was not difficult to perform; the next step was to make two parallel cuts, with scissors, in the vesico-vaginal septum, the incisions being about half an inch apart, and an inch in length. These cuts were on each side of a central flap which was drawn forwards beneath the pubic arch and joind at its edges with the freshened tracks prepared for them: the joining was by fine wire sutures, and the flap of bladder was thus converted into a urethra. There seemed to be enough tissue in the floor of the bladder to reconstruct the lost urethra, and have no undue tension on the flap. A self-retaining catheter was kept in the new-made urethral passage until the sutures were removed. The operation was suc-

FIG. 211.



Self-retaining female catheter.

cessful. Nothing was wanted but power to retain the urine. To get by the annoyances of this defect, I invented a self-retaining female catheter, which can be worn by a woman at all times. A urinal is to be attached to one thigh, and a piece of rubber tubing conducts the urine from the flaring mouth of the catheter to the cavity of the rubber-bag. I have used the same apparatus for incontinence of urine in the female. The self-retaining catheter is worn with ease; and the patient can remove it daily to have it washed, and then re-insert it. The instrument should be of the length, size, and shape of the one represented in the accompanying diagram.

RECTO-VAGINAL FISTULA.

An opening between the rectum and vagina, whatever may have been its cause, is to be closed by the same kind of an operation as that described for occluding a vesico-vaginal fistula. The edges of the chasm are to be pared or freshened, and then the edges of the wound are to be closed with silver sutures. The angles of the traumatic fissure should not be too oval, lest the sutures pucker or gather the tissues, and thus prove an obstacle to union.

Scissors are to be used to freshen the edges of the chasm, swabs being employed to keep the blood from obscuring the course of the cutting instruments. The sutures are to be placed close to each other, the hollow, needle-like suture bearer being used to pass the wire from one side or border of the chasm to the other. The fingers may be used in most cases to make snug and fasten the sutures; if not, two pairs of forceps may be employed for that purpose. Fingers may be used for this purpose in vesico-vaginal operations, if the first and central suture ends be employed to drag the parts near the ostium vaginæ, or within easy reach.

The bowels should be kept locked with repeated doses of opium for ten or twelve days, to prevent strain on the sutures. A pipe, like a syringe nozzle, should be introduced through the anus into the rectum every time flatus is felt to be seeking vent. Probably the collection of gases in the rectum tends to tear open the wound. The evacuation of flatus through a pipe or tube is therefore desirable.

The first movement of the bowels, after a recto-vaginal operation, should be invited by gentle persuaders. The syringe may be used to liquefy and soften the lowest fæces, and castor oil can be taken by the mouth as a cathartic. In a few days after the first alvine dejection, there is no danger of tearing open the seam.

RUPTURE OF THE PERINEUM.

Laceration of the perineum occurs during the last throes of labor, the child's head not rising soon enough to let the posterior commissure of the vulva slip over the sinciput without being torn. Primiparous women are most liable to suffer from this distressing and unfortunate accident, and it is not probable that the laceration is always due to carelessness on the part of the accoucheur, for the most careful and experienced obstetricians have been pained to find that their patients occasionally fall victims to perineal separation, the rent extending a short distance in some instances, but clear into the anus and rectum in others. As soon as the inferior commissure of the vulva yields to the slightest laceration, the tear may rapidly extend, during violent labor throes, to the sphincter ani, and even through it. Accoucheurs have delivered women when they knew all was right until the last expulsive pains, yet have been surprised to learn, from nurses or the patients themselves, that there was something wrong about the perineum. The rupture occurs so quickly and inappreciably that the medical attendant, engaged in receiving the child, and in endeavors to make the uterus contract by squeezing the abdomen, may fail to discover that a rent has taken place. However, a thoughtful obstetrician will test the perineum while he is employed in delivering the placenta, so that he may be the first to discover a laceration when one exists.

When rupture of the perineum only extends a half inch or so, the parts so far heal that little more than a notch remains; but a rent that reaches to the sphincter ani should be closed at once with sutures, that subsequent trouble may be avoided. If the sutures be well placed, and kept *in situ* for three days, the union by first intention usually takes place; yet, to secure a good result, the joining should be effected before the obstetrician leaves the patient, for it is found that a lacerated perineum, left twelve or fifteen hours, is not likely to heal; and it is not well to wait for perfect cicatrization, and the recovery of the patient from the puerperal state. It occasionally happens that a badly ruptured perineum will recover itself in three or four days, when nothing is done but to keep the patient's limbs close together.

[illegible] consequences attendant upon rupture of the perineum [illegible] together with prolapsus of the bladder. [illegible] in the rent, the retention of fæces [illegible] always within control; and women who are [illegible] perineal laceration, are apt to be sterile, [illegible] power in the vagina. No woman can [illegible] comfortable while a victim to an unclosed perineum. [illegible] argument employed by the older surgeons against closing a [illegible] perineum was the probability that a repetition of the [illegible] would occur at the next parturition. However, the operation for closing the fissure has been brought to such a state of simplicity, and certainty as regards results, that no legitimate reason can be raised why a well timed attempt should not be made to close the fissure by an operation.

To those who have had no experience with the treatment of perineal ruptures, the operative procedure for closing the fissure appears simple and free from difficulties, but a little experimental knowledge soon dissipates such shallow notions. The muscles in the floor of the pelvis draw the sides of the fissure apart, and otherwise distract the true presentment of the parts implicated. In some cases the descent of the uterus and bladder, and in others when the sphincter ani is involved, the foldings of the mucous lining of the rectum contribute more or less to the perplexity of the young practitioner, who has a case fall into his hands for treatment, and when he compares the diagrams in his text-book, which are attempts to represent the disease [illegible] he thinks the artist might have done better, [illegible] representative in any respect.

[illegible] S. [illegible] of London. He [illegible]

[illegible]

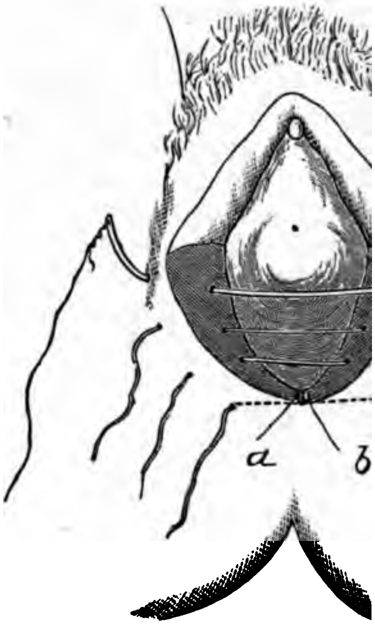
mucous membrane between these two sides, embracing the edge of the rectum where the sphincter was lost, and this must also be carefully denuded—very carefully, because, if there remained the slightest portion of mucous membrane around or even near the rectum, then most certainly there would be a recto-vaginal fistula, after the restoration of the perineum. As soon as the denudation is complete the sphincter should be divided in two places by using a straight bistoury with a blunt point for the purpose. The knife is to be introduced into the anus and rectum an inch or more, with its edge directed backward as if to cut towards the coccyx, yet diagonally outward, severing all the structures, as mucous membrane, muscle, skin, and whatever tissue intervened. The incisions should extend outward and backward, on each side of the coccyx, to the distance of an inch or two from the anus. The thighs are then brought together preparatory to the introduction of the sutures."

It is to be borne in mind, that the patient is to be in good condition for the operation; the menstrual period is not to be reached for ten or twelve days; the bowels should have been freely evacuated some hours in advance of the operative procedure, and the bladder should be empty.

The freshening process is best performed with a scalpel, scissors not being as good as the knife. The cicatricial surface on each side is to be wholly removed, so that the denuded surfaces shall correspond with the original perineum. The vulval opening should not be made smaller nor left longer than it was originally. The surface to be denuded on each side is triangular in shape, and there is a narrow belt between the two sides, which crosses the rectum where the sphincter has been lacerated. To make sure that the denudation shall be complete, it is well to pare one side, then the edge of the rectum, and finally the other side, without tearing or severing the strip taken off. If the surfaces be denuded by taking off piece after piece, the blood may obscure the freshening process, and deceive the operator, who may flatter himself that he has made every portion fresh, when in fact a small spot may escape his attention, and ruin the prospects of a successful issue. The hemorrhage attending the freshening process is inconsiderable, but it is sufficient to prevent the operator from seeing all points distinctly. The narrow strip taken from the bottom of the wound must be dissected off with great care, and with especial reference to the manner the parts will come

together when the sutures draw them i
the recto-vaginal septum may be disto
in need of special management while
tures be not competent to make an ev
with no considerable folding or tension

FIG. 212.

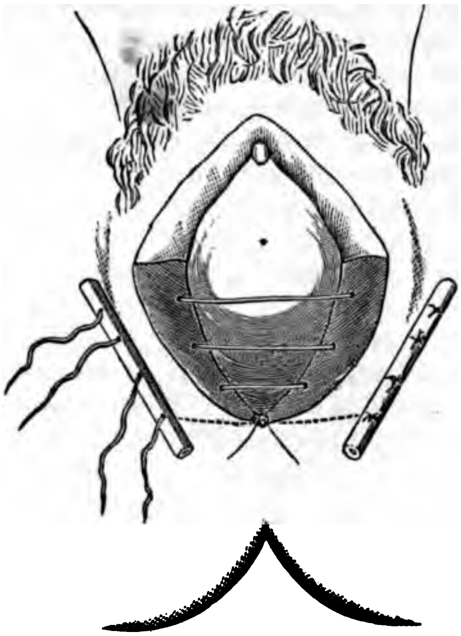


Surfaces freshened and sutures be

The introduction of the sutures ma
long curved needle, with a needle in a
suture carrier. As the curve required
needles with different curves should be
a handle is the easiest to manage ; it ha
is not to be threaded until it has been
of the fissure. The ends of a piece of
to be put through the eye, and twisted
the needle is withdrawn, the suture is
in place the needle is clipped away, but
of the suture which is to surround a pi
or a bit of leaden catheter about an i
made to enter the flesh at a distance of
the edge of the fissure, and transfixing

deep as possible, it emerges through the skin on the opposite side, at the same distance from the edge of the fissure that it found entrance.

FIG. 213.



The freshened chasm in the perineum is to be closed by pulling upon the free ends of the sutures when the bars are pressed together. After due approximation, the two upper and the two lower ends of the sutures are to be twisted into knots.

After the four sutures are passed in the same way, and the loops surround the "quill" on that side, the free ends are to be used to draw the sides of the fissure into apposition, the thighs of the patient in a flexed attitude being brought together in order to take the strain from the sutures, and to aid in joining the freshened surfaces. The second "quill" (piece of leaden catheter) should have a row of four holes bored through it, each being about a quarter of an inch from the other; and when the free ends of the sutures are put through these holes, the ends of the two upper and the two lower are to be fastened together by twisting them, after the sutures are made as tense as they can be, an assistant pressing the two quills or clamps towards each other while the operator pulls upon the sutures.

After the deep parts of the fissure are brought snugly into apposition by the quill-sutures, the edges of the rent should be united with three or four interrupted sutures. These may be of finer wire than that used for the deep sutures. No. 22 will do to hold the quills, and No. 28 the borders of the wound.

Great care is needed in passing the first or deepest suture, as it is to dip deeper than the bottom of the fissure, and not enter the mucous lining of the rectum. The others are to pass near what is to be the mucous lining of the vagina.

The after treatment is to be well direc[illegible], and executed with care and discretion, or a nicely performed operation will fail. The patient is to be placed on her side, with the lower extremities in a state of flexion, and tied together with a towel to prevent the limbs being parted by any accident. The urine should be drawn off every five or six hours, or it may be evacuated as fast as it accumulates, by employing a self-retaining catheter, and a piece of rubber hose to conduct the urine into a basin. The bowels are to be kept from moving for eight or ten days by the administration of opium, and the use of a diet that affords little waste. The food should consist chiefly of beef-tea, milk, and such varieties as are nutritious and easily digested.

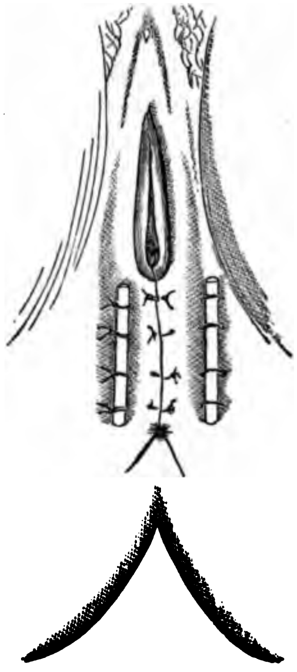
The sutures are to be removed on the tenth day; when, if the urine has been kept out of the vagina and free of the wound, and the bowels have not been moved, a snug union may be expected. But how often the operator is disappointed! Some part of his plan has failed, and the operation proves futile. If the sutures do not hold the sides of the fissure in contact, blood, pus, and other fluids collect there, and obviate union. During the healing process the wound is to be kept as clean as practicable by using a syringe or sponge two or three times a day. A solution of borax and salicylic acid may be employed as a wash to keep the parts cleanly. Foul discharges from the vagina are often the cause of non-union in the treatment of ruptures of the perineum. Straining at stool must be avoided while the healing process is going on. If a passage from the bowels can not be prevented, the fæcal matter should be liquefied by the use of enemas.

It has been supposed that a restored perineum is rigid, and liable to tear open at the next parturition, but experience teaches the contrary. The only part of the structure that is less yielding than the original tissue is the cicatricial line; and that embraces too little space to exert much modification on the elasticity of the parts.

In the event that the recto-vaginal septum is torn open to the extent of an inch or more, it is best to freshen the edges of this part of the rent, and close it with silver sutures, as a distinct operation, to precede the closure of the perineal fissure by several weeks. It has been ascertained experimentally that an attempt to close the rent in both structures at one operation is liable to be followed by a recto-vaginal fistula, just above the sphincter. In joining a rent of the vesico-vaginal septum, the edges are to be well freshened, and then brought in apposition by the use of interrupted sutures, fine silver wire being used to effect the junction. The ends of the sutures are to be twisted to take the place of knots, and then cut off quite close to the fastenings.

A recto-vaginal fistula, which is left after the coalescing of a ruptured perineum, is quite difficult to cure. In the first place, the perineum may be in the way of easy manipulation, and a collection of fluid, flatus, and fæcal matter above the sphincter tends to prevent the freshened edges from coalescing. Besides, the opening is so short and broad that there is undue tension upon the middle sutures. If the fistula be elongated into an elliptical opening, the edges come together with less strain. In some instances it is necessary to lay open the perineum in order to cure the fistula. A very small fistulous opening may be closed by the repeated application of a hot wire.

FIG. 214.



This diagram shows the deep sutures twisted over bars made of a leaden catheter; the superficial sutures knotted in the median line; and the incisions which divide the sphincter ani.

When the recto-vaginal opening is quite large through loss of structure by sloughing, it may be necessary to supply tissue by a plastic operation, one flap being turned down, and the other up, so that the raw surfaces of each shall rest in contact. They are to be held together by the use of sutures; and their juncture with the recto-vaginal septum above is

to be secured with care, both as to fresh
dinarily a recto-vaginal fistula is to be
tive procedure that is found available
vaginal fistula. The borders of the op
freshened with scissors while dilators
upon; then wire sutures are passed a
with a hollow suture bearer, such as
raphy, and vesico-vaginal operations.
locked with repeated doses of opium fo
the sutures may be cut and removed
period, is to be nourishing, yet of a ki
matter. Of course the bowels are to be
hours before the operation is performed.
operative procedure, may be in the a
turned upon the side. The operator m
best posture for exposing the parts to
or three assistants will be needed. T
order that the light may be favorable
the patient should be in good conditi
menstruation do not take place during
which will last ten or twelve days.

The border of a recto-vaginal fistula
contracted in the course of time, so t
and closed, it serves as quite a barrier
of hardened fæces; but fluids and gase
ingly. For a few months after a recto-
the fæcal matter may escape through th
of years it may pass largely through the
who suffer little inconvenience from
refuse to undergo an operation for the c
A vesico-vaginal fistula dribbles urine a
woman so distressingly uncomfortable t
through the arts of surgery.

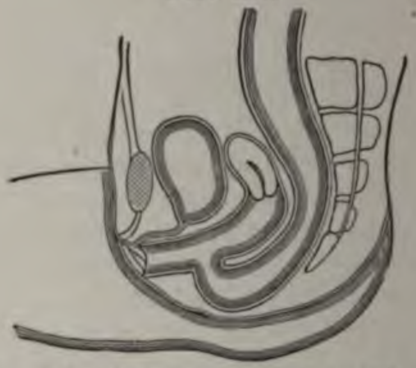
SECTION XVIII.

DISEASES OF THE ANUS.

Not unfrequently children are born with a closed or imperforate anus. This state of things may not be observed for a day or two, or until the distresses of the infant from having no anal outlet, lead to inquiries and examinations. It is customary for the obstetrician to ask, while making his second visit to the parturient woman, if the child has voided urine, and had a passage of the bowels; and if there has been no alvine evacuation, he is led to explore the anal region, to see if every thing is normal. And he has to examine with some care, or an imperforate state of the anus may escape his attention. The anal mark may exist and not the aperture. In some instances the occlusion is produced by a diaphragm of integument, but oftener there is considerable depth of tissue before the bowel is found. The colon usually terminates in a *cul-de-sac*, or pouch, as high as the bladder, in male children; and occasionally there is a communication with the urinary apparatus. A male child has lived for months with no outlet for the escape of fæces, except through the penis. At length the narrow and complex passage gets clogged, and the victim of malformation dies.

In a female child the rectum may terminate in the vagina, constituting a natural recto-vaginal fistula. In one instance, coming under my observation, the rectum connected with the vulva at the inferior commissure. The communication was so small that the infant never had a full and free evacuation of the bowels, but was always straining as if in distress to free the rectum. I found the anal mark in the usual place, and to relieve the tenesmus I carried a grooved director into the abnormal opening, and to the point where the anus ought to be, and then incised the obstructing tissue. At once a large quantity of fæcal matter was discharged, and a rattling in the child's respiration ceased, though the unpleasant sound had existed from birth. The child was several months old when the operation was performed. A plug of wood was kept in the artificial anus for a few days, to prevent the incised surfaces from uniting, but the physician having the case in charge reported that there was no disposition for the fæces to take the old route, nor for the new one to close.

FIG. 215.

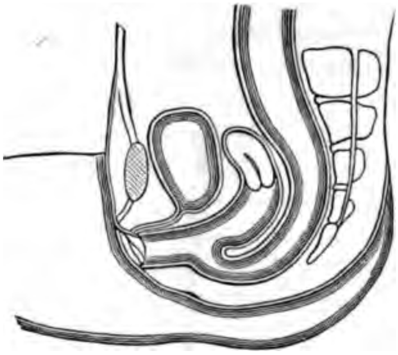


This diagram represents imperforate anus, and termination of the rectum in vagina. A pouch in the rectum near where the anal outlet should be, shows how easily an artificial anus might be established by means of puncture.

In another case the rectum joined the vagina so high above the vulva that I made an artificial passage with the point of a bistoury, cutting slowly and carefully in order to establish the canal about where it should be. After the knife reached the bowel, which was known by using a grooved director in the vagina and fistulous communication, the artificial passage was enlarged by incising the parieties of the wound in various directions. I then introduced a small cylinder of wood, a half inch in diameter, and ordered it to be worn most of the time for two or three weeks. The treatment proved very successful, all the fæces passing by the artificial outlet, though gases sometimes escaped through the little recto-vaginal fistula, which never entirely closed.

It can be determined by using a bent probe in the vagina and fistula, whether the pouch of the rectum reaches low in the pelvis, or the bowel comes down as a narrow tube to an opening high in the vaginal canal. When the pouch of intestine extends nearly to the integument where the anus ought to be, an incision may be made in the skin, and the bowel seized with forceps, dragged down, and its edges joined with sutures to the border of the artificial anus. In the male child there is little in the way of a guide to go by. If the fæces bulge a spot outwards, in the region of the anus, the presumption is that the pouch of intestine is near the skin, and that therefore it may be reached in safety with a trocar or bistoury.

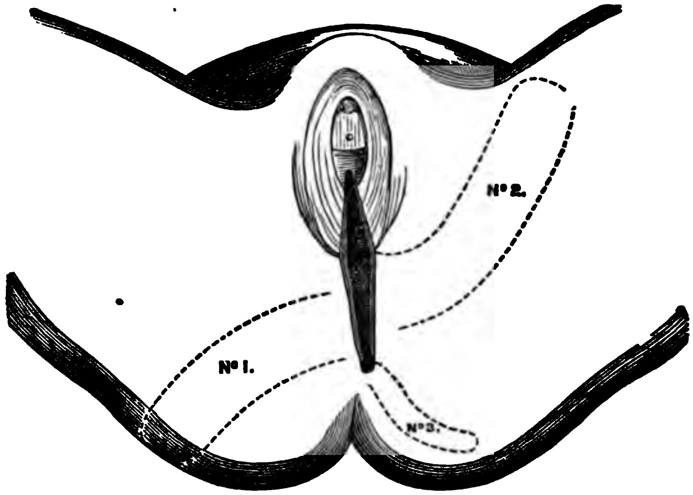
FIG. 216.



Deep character of the rectum.

I once performed a plastic operation upon a girl eleven years of age, who possessed an imperforate anus and a natural recto-vaginal fistula, at the distance of an inch or so from the vulval orifice, or at a point near the womb. The first step in the operative procedure was to cut through the floor of the vagina, and as deep as the rectum and anus should extend. The divided structures would correspond with those ruptured in laceration of the perineum—an accident which occasionally attends parturition. I proceeded next to form a septum between the vagina and the artificial rectum and anus, and at the same time to close the original recto-vaginal aperture. This was done by first freshening the borders of the fistula, and then by transplanting flaps of integument to form the septum. The first flap, No. 1, shown in dotted lines, was dissected from the buttock up to the side of the fissure where its base remained attached, to insure vascular supplies; and its free portion was turned over into the traumatic chasm, where its dermal surface was to form a roof for the artificial rectum and anus. A silver suture previously carried through the remaining recto-vaginal septum, above the original aperture, was now carried through the upper end of the transplanted flap, and made to close the fistula. A second flap, No. 2, shown in dotted lines, was dissected from the groin and inside of the thigh, on the opposite side, its base being left attached to the side of the perineal fissure, at a point ranging a little higher than the first flap. This was swung into the fissure so that its traumatic surface looked downwards, and rested on the upper and traumatic surface of the first or under flap. The dermal surface of the second flap formed the floor of the vagina. The upper end of the last flap was secured by sutures to the original recto-vaginal septum. A third flap, No. 3, shown in dotted lines, was now dissected from the left buttock to a base near the posterior aspect of what was to become the anus, and twisted into the bottom of the fissure, its dermal surface being upward to form a floor to the artificial rectum. This was not fastened in place with a suture, but a plug of wood, the thickness of the finger, was placed in the new formed canal, to press the transplanted flaps into the position they were designed to take. This plug was to be taken out, washed, oiled, and re-inserted every day, and at times when a fæcal evacuation was demanded.

Fig. 217.



This diagram represents a method of establishing an artificial anus and rectum, and at the same time closing the recto-vaginal aperture.

The operation proved a complete success, the disgusting fistual having been closed, and a natural anal outlet established. By this dermo-plastic procedure, which has some of the elements of originality about it, I succeeded in restoring to a candition of comfort an interesting human being who had been afflicted from infancy with one of the most unfortunate of malformations.

ANAL FISTULA.

A fistula is a pipe or sinus in the soft tissues which does not readily heal without surgical interference. Certain parts of the body are liable to the disease, especially those in the region of the anus; and when confined to these parts the difficulty is called *fistula in ano*, a term signifying a pipe or false passage about the anal orifice, though not necessarily communicating with the anus or rectum.

When the pipe extends from an opening in the skin to a cœcal pouch somewhere in the tissues in the vicinity of the anus, or rectal cavity, yet not joining the bowel, nor having any communication with it, the disease takes the name of *external blind fistula;* and should the false passage begin in the mucous lining of the anus or rectum, and terminate in the adjacent structures without reaching the skin, the difficulty is denominated *internal blind fistula.* Both forms have been described as *incomplete* fistula, to distinguish them from that variety which reaches, in a course more or less tortuous, from the skin to the mucous membrane, and called *complete* anal fistula.

Scrofulous and tuberculous persons are the most liable to fistulous diseases; though the robust, should they have an abscess in the vicinity of the anus, are by no means exempt. Sedentary habits have been pronounced a cause of anal fistula, though my observations do not warrant such a conclusion. It is said that the shoemakers and tailors of London have a guild, or society, admission to which requires that the applicant have a fistula. The object to be gained is information as to the best means of cure; therefore there is nothing absurd about the existence of such an organization.

Fistulous affections are more common among men than women, though the latter are as liable to scrofula as the former. The disease is oftenest met in those between twenty and fifty years of age, though it is occasionally encountered nearer the extremes of life. Fistulæ are not very dangerous in themselves, yet they are often associated with a constitutional cachexia that is fatal in its tendencies. Consumptives are especially liable to fistulous complications.

Persons having anal fistulæ usually labor under the apprehension that the disease is incurable, therefore the mental depression attending it is a serious obstacle to the process of cure, inasmuch as the mind in a cheerful state favorably influences those bodily functions engaged directly or indirectly in the work of reparation; and *vice versa.* It is difficult to cure a patient impressed with the idea that recovery is impossible.

The early history of fistula is that of an abscess or phlegmon in the region of the anus. An individual who has heat, pain and swelling in the perineum or by the side of the anal outlet, imagines a boil is forming, and may subject the inflamed part to poultices or other antiphlogistic treatment. At length the tumor voluntarily discharges fetid pus, or is laid open with a bistoury. The evacuation of purulent fluid is attended with relief and the subsidence of inflammatory symptoms, but the cavity evacuated may not fill with granulations and become extinguished. Indeed, it is more likely to shrink into a pouch or sinus which secretes a sero-purulent fluid, and extends towards the anal apparatus. The loose structures adjacent to the sphincters favor the continuance of the disease, and the extension of fistulous passages in various directions. While there is not much pain attending the burrowing of a fistulous channel, the patient is apt to lose flesh, to become dispirited, and to exhibit symptoms of exhaustion. Rigors, shivers, or chills, alternating with hot flashes, febrile manifestations, night sweats, loss of appetite, disturbed sleep, and kindred ills, are suffered by most persons during the progressive stages of anal fistula; but after the disease has extended as far as it will, the feverish symptoms may subside, so that the patient enjoys prolonged seasons of average good health. However, there is a probability that some of the false passages may become obstructed, or that the openings in the skin will so far heal that gathering fluids can not escape, either of which conditions is followed by an inflammatory tumult, and active symptoms peculiar to the early phases of the disease. The consequence is that new outlets are established, and other routes formed for the escape of pent up fluids.

An abscess usually points, or opens a way for the evacuation of its contents, in the direction of least resistance; hence, in the event that one forms near the anus, it will open into the bowel, constituting internal blind fistula; but if it be near the skin, it will open outwardly, making external blind fistula; and so liable is the disease to progress, until a communication is established from skin to mucous membrane, that an incomplete state rarely lasts long. The tendency of the disease is to form a canal from an opening in the skin to one in the mucous lining of the bowel, and to have several branches that terminate in cœcal pouches. In bad cases the structures between the point of the coccyx and the tuberosities of the ischium are thickly traversed with purulent sinuses and fistulous canals. Not unfrequently a subcutaneous or superficial set of fistulæ exists, and a deeper system of perforations, yet the two are apt to communicate with one another at some point.

It is not uncommon for a fistulous track, when it is extending, to be indicated by an indurated and somewhat sensitive ridge or belt that can be easily traced by the finger of the patient. He often calls the surgeon's attention to the route the forming fistula is taking.

From what has already been said, it is to be assumed that in fistulous cases of long standing, there is a communication between an opening in the integument near the anal outlet and another in the mucous membrane of the bowel. Although it may be difficult or impossible to follow the tortuous course of a fistula with a probe, the patient will answer, when asked, that he has felt flatus escaping through the fistulous passage. The exploration of a tortuous and complex fistula is not an easy task. The parts are often extremely sensitive, and the patient irritable However, the surgeon is not to be thwarted or misled by the patient's complaints or misconceptions; but he is to persevere in his endeavors to understand the extent and complications of the fistulous canals. A silver probe is to be bent, and carefully carried in every direction while testing the walls of the false passage. Sometimes the instrument has to be crooked like a fish-hook, in order to find whether a branch turns away from the bowel, though the main channel has been tracked into the anus or rectum. And while making these explorations the manipulator is not to be so gentle or timid as not to discover the various ramifications of the fistula, nor so rash as to force the probe through the walls of the pipe and into sound structures, believing all the time he is following a fistulous passage. Fistulous tracks are often so sensitive that the patient can not endure the probing until he is under the influence of chloroform.

A fistula ordinarily opens nearer the anal orifice than is generally supposed. It may in its progress dip rather deep, yet it is likely to terminate quite near the anal opening. In some cases, however, it enters the bowel between the external and internal sphincters, and quite rarely as deep as the deepest parts of the sphincter apparatus. Fistulous sinuses that have a communication with the anus outside the sphincter may burrow in the loose structures as far back as the coccyx, or in the nates four or five inches from the anal opening. In rare cases the perineum between the anus and scrotum is involved. In a woman who at length recovered from a depressed vital state, I found an external fistulous orifice in the median line, between the posterior commissure of the vulva and the anus, through which a probe could be carried in two directions, one branch of the fistula leading into the vagina, and the other into the anus. I incised the branch leading into the anus, and thus secured its obliteration. The other branch was left to itself, and in the course of a year it healed. During the process of cure the patient was taking arsenic, phosphorus, iron, iodoform, and other agents designed to remove tubercular deposits in the lungs. During the time she gained flesh and strength, and got rid of a harassing cough, daily rigors, night sweats, and other disagreeable symptoms.

While exploring a fistula it is well to carry the probe as far towards the bowel as practicable, and then introduce the forefinger into the rectum, in order to ascertain the distance between the end of the instrument and the digit. If only the walls of the bowel intervene between the probe and the finger, it is to be presumed that an orifice exists near that point, though it can not be detected by the exploratory manipulations. An anal speculum is not very useful in endeavors to discover the internal orifices of fistulæ. Spatulæ to dilate the anus, when carefully handled by an assistant, are sometimes quite valuable, especially if the pipes are of the internal blind variety.

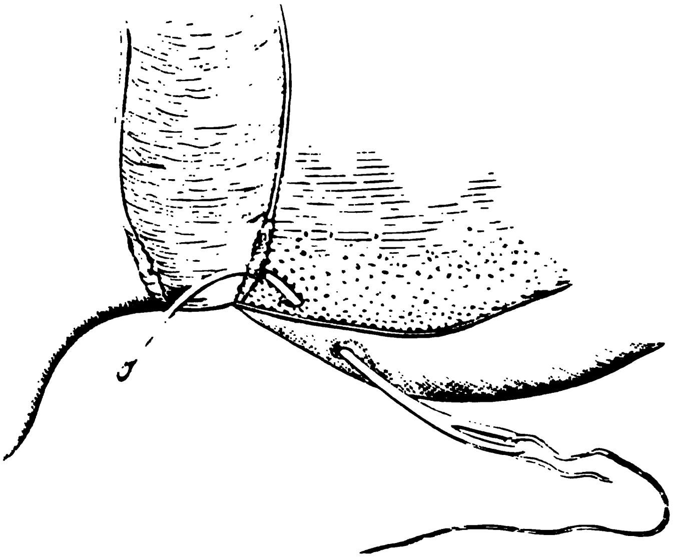
TREATMENT.—When an abscess exists in the ischio-rectal fossa, it should be freely opened, and the purulent cavity swabbed with the tincture of iodine or a strong solution of carbolic acid. The free incisions facilitate drainage, and the topical applications tend to destroy the pyogenic membrane, and to establish granulation and healthy reparative action. This course of treatment is preventive of fistula, and as such is often more valuable than a cure of the mature disease. Inasmuch as the irritative abscess is acutely sensitive and painful, it may be judicious to put the patient under the influence of an anæsthetic, before attempting to incise the diseased tissues, and to cauterize the purulent cavity. Few patients will permit any thing more than simple evacuation of the pus, unless their sense of feeling be first benumbed with chloroform. But the surgeon may not be called upon to treat the initiative stages of fistula, therefore when he sees the case, the phases have passed which call for preventive measures.

Scarcely any kind of disease has elicited such warm discussions in regard to its successful treatment as anal fistula. Many different methods of cure have been employed, and all with some failures and some good results. The incising process is in best repute among the best surgeons of the present day, yet so many unsatisfactory results attend the operation—the fault not being so much with the principle as with the manner of executing it—that many practitioners openly condemn the use of the knife as barbarous and unscientific; and if a timid or unscrupulous surgeon takes a case that has been unsatisfactorily operated upon, and cures it with a ligature or other simple means he flatters himself, and readily makes the patient believe, that he has achieved a triumph over a surgeon of greater fame, and established a new method in surgical art. But if he will study the history of surgery, he will find that the use of ligatures is exceedingly old, and that it would be difficult to find any method that is novel and valuable in the treatment of anal fistulæ. Those who advertise that they cure fistula without the use of the knife, are generally mountebanks, who aim to deceive the unwary. One of the latest means adopted to supplant the use of the knife, is to employ an elastic ligature for the purpose of dividing the soft tissues between the fistulous track and the tegumentary surface; but it has been experimentally proven that the knife is the quickest and surest method of curing anal fistulæ.

In cases where fistulous sinuses are short and free from induration, the repeated injection or application of chloride of zinc caustics may lead to a cure. I have followed this plan several times, in cases where an operation did not seem desirable, or was opposed by the patient. The stuffing of a sinus or fistulous track with pledgets of lint soaked in a caustic solution, is only a variation of the same method. A serious objection to the process is that it sometimes fails. When a branch from the main fistula exists, the pledget and caustic plans are not likely to succeed. Besides, the trouble attending daily dressings for weeks and months is simply prodigious.

The method of treatment by ligature, when the fistula is simple, has much to commend it, especially when the patient enter-profound dread of a cutting operation. The ligature is passed through the eye of a probe which has been curved to facilitate its passage through the fistulous track to the bowel and [illegible] the anal aperture. After the ligature has been drawn by the probe to the place where it is to rest, its ends are to be tied [illegible] a piece of rubber tubing as thick as the finger, or across a piece of sponge. As the ligature cuts its way out from day to day the tubing or sponge is to be twisted to tighten the ligature, thereby hastening the cutting process. The wound generally heals as fast as the ligature travels through the flesh. I have used a sponge tent instead of the rubber tubing. A ligature will generally cut its way through in two or three weeks, when left to itself, no hastening process being adopted.

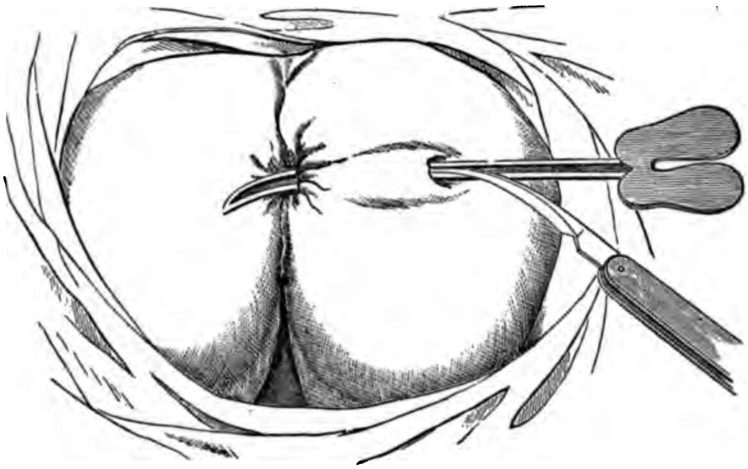
FIG. 218.



The method of introducing a ligature into an anal fistula. A section of the nates is taken in order to show the passage of the probe.

If the fistula be incomplete, or the probe can not be made to open the cavity of the bowel, a long curved needle may be employed instead of the blunt-pointed instrument. A finger in the rectum receives the point of the needle, and guides it to the anal outlet. Even if the fistulous orifice in the walls of the bowel be not traversed by the needle and ligature, the inflammation provoked will result in obliteration of the entire track. Needles of various lengths and curves are needed to meet the conditions of a variety of cases. I have drawn the temper of an ordinary darning-needle, and then bent it to the desired curve for the case at hand. When the fistula runs deep, and its connection with the bowel is above the sphincters, the ligature should generally be used, for its slow passage through the flesh while cutting its way out is not attended with hemorrhage, and the healing process prevents the sphincter from losing its functions. The chief arguments against the general use of the ligature are, first, that the process is tedious; and second, that in a complex fistulous state, in the ischio-rectal region, the tortuous and ramifying sinuses can not with any degree of certainty be discovered, and subjected to the influence of the ligature.

FIG. 219.



About to lay open a fistulous track raised upon a grooved director.

The incising process—a grooved director and knife being employed—is the quickest and generally the most efficient method for obliterating anal fistulæ. It consists in laying open the fistulous track from one end to the other, the superimposed structures being completely divided. In a simple fistula the single cut is sufficient; and if branches exist, the primary incision makes it easy to expose and incise other sinuses, the process being complete when all the false passages have been converted into incised and open wounds. In very few instances does the entire sphincter have to be divided, for, as before stated, the internal orifice of the fistula is apt to be near the anal outlet. In many instances only a part of the sphincter has to be divided; in a few cases the entire sphincter apparatus has to be cut across. In the latter event the hemorrhage may be considerable. In two instances I have been obliged to use styptics and firm tampons of lint to arrest the bleeding. The hemorrhage attending the division of an ordinary anal fistula is insignificant.

A patient who is about to have a fistula divided with the knife, and without chloroform, may place his knees in the seat of an arm chair, and rest his breast on its back. An assistant pulls the nates apart, while the surgeon introduces a silver grooved director into the external orifice of the fistula, and carries the instrument to the finger that is pushed into the rectum. If the walls of the bowel offer no opening for the ready passage of the grooved director, the entering extremity of the instrument is thrust through the coats of the rectum, and then, with the aid of the finger, is made to emerge at the anus. Nothing remains to be done but to split the superimposed structures by sliding a knife along the groove of the director. The entire process is as simple as any thing in surgery can well be. When the fistulous track runs deep, the grooved director should be bent into a sharp curve, in order to facilitate its passage to the bowel, and its escape from the anus.

After the primary incision is made, the finger and probes are to be used in seeking other sinuses. So liable is a fistula to be complicated that the search for additional pipes should not be abandoned until the exploration has been thorough. Fistulous disease is apt to develop itself on one side of the anus, yet cases are common in which both sides of the ischio-rectal fossæ have been invaded. It is particularly enjoined to hunt for fistulæ extending back toward the coccyx, or on outward into the buttocks. After those regions have been explored, the forward direction, corresponding to the side of the raphe, or median line of the perineum, is to be examined with probes. I have so often overlooked or failed to find diverging sinuses, that I feel all the more the necessity for imparting these cautions and injunctions. It is not taken pleasantly by a patient, when two or three weeks have passed since the primary operation, to be informed that a new fistula has been discovered which must be operated upon; and if two or three of these disappointments occur, the surgeon is charged with blundering and inattention.

In complicated cases I prefer to do the exploring and cutting while the patient is under the influence of an anæsthetic, for I can then examine deep parts without being resisted and thwarted; and if cuts have to be made in three or four directions, the patient is unable to protest against the extensive incising process. It is not easy to make a patient, unacquainted with reparative action, believe that several incisions made at the same time will heal as soon as a single cut.

In several instances I have found the ischio-rectal fossæ thoroughly perforated with sinuses, and the false passages communicating with one another from one side to the other, in the space between the anus and coccyx. In such cases the soft tissues of the fossæ have to be incised in every direction, though the rectum and anus may be unperforated, and stand out in an unsupported manner after the incisions have been completed. In most instances the integument of the anus can be left in connection with other tegumental structure by a narrow isthmus in front, corresponding with the median line. I have known two sinuses to extend forward as far as the scrotum, and not communicate in front, though they extended in parallel lines quite near each other. Such sinuses are to be incised separately, yet the median septum between them is to be left intact. Although the soft tissues be extensively incised, and an inch or more of the lower end of the bowel seem unsupported, it will not be long before the wounds will fill with firm granulations, and the new structure be less liable to become fistulous than the original loose flesh.

While one of the graver of these operations is performed, the patient, under chloroform, should rest on the side, with the anus exposed to a good light. The bed or lounge should be protected with an oil-cloth, or old cloths that may be washed or burnt. And as the discharges may be pretty free for several days, the bed should be prepared accordingly. One or two assistants are a convenience, if not a necessity, while making extensive incisions and explorations. There is rarely much hemorrhage that attends a division of complex and long-ranging sinuses. Wounds in other parts of the body would be attended with more bleeding. The hemorrhage which attends a division of the sphincter ani is greater than that which comes from incising adjacent structures.

It is well for the bowel to be emptied with a cathartic the day preceding the operation; and the patient should be in as good condition as the nature of the disease and surroundings will admit before the operation is performed. I have medicated patients for weeks before operating upon them, and the rapid rate of cure which followed seemed to justify the course.

Extensive anal fistulæ in patients near their death from phthisis should not be subjected to an operation; but the cure of a fistula in the incipient stages of pulmonary disease rarely operates disadvantageously, and often quite favorably, a prominent source of annoyance being cut off. Besides, a patient medicating for the cure of an incised anal fistula needs the same medicines and dietetics he should receive if medicated for the improvement of phthisis or tuberculosis.

Ordinarily it is not prudent to attempt the cure of fistula in ano without the prolonged use of constitutional remedies. What might be denominated a tonic and "alterative" course would be the best, the digestive, absorptive, and assimilative processes being prominently kept in view while the patient is under treatment. The iodides may be occasionally used, yet not as freely as in constitutional syphilis. The "acid solution of iron" is valuable to be used while treating anal fistulæ. Three or four drops in water may be given every three hours every other day, and the following medicine may be administered on the alternate day:—

℞ Syr. lacto-phosphate of lime, ℥iij.
Fowler's solution, fʒj. M.
Dose, half teaspoonful every three hours every other day.

The diet of the patient should be highly nutritious and easily digested; and here it may not be inopportune to say, that, as regards diet, every person is a law unto himself, and no "bill of fare" that may suit everybody can be devised.

After a fistulous track has been incised, the wound may be kept open with lint for two or three days, and then the traumatic surfaces are to be kept in a reparative state by the daily application of Mayer's ointment or any other gently stimulating cerate. I often employ a pomade which has a small amount of sulphate of zinc in it, and apply the ointment with a swab or pencil of wood.

One of the important features in the treatment of an incised fistula is to prevent a bridging of the channel with neoplastic bands, and to make the wound heal from the bottom. It is of no advantage to keep pledgets of lint in the chasm, but the wounds are to be left freely exposed to the air. While the patient is moving about, lint packings will not stay in the traumatic fissures.

The wound is to be carefully explored every two or three days, in efforts to discover fistulous tracks and places where the healing processes are seemingly sluggish. If a pocket is found it must be slit in two or three directions, to prevent the accumulation of acrid matter, and the establishment of a new fistula. Pressing the walls of the chasm is an excellent method of discovering fistulous routes, the issue of pus or purulent fluid from some orifice or crevice indicating that a sinus remains in that quarter.

Such a variety of morbid conditions exists in an individual having fistula, and so complex is the sinuous ramification, that much time is generally required to cure a patient suffering from fistulous disease. I have often sent patients home the same day an operation was performed; but this is not generally a safe practice. It is better to keep the patient under special care for a week or two, in order to ascertain quite positively that the fistulous tracks are all incised and doing well. It often requires several months to effect a complete cure, therefore patients are anxious to go home before the wounds are entirely closed.

The cicatricial tissue that remains after a fistula has healed, is apt to exude a serous fluid that keeps the parts damp or wet, and sometimes in a state more or less offensive. To relieve this, the following lotion may be employed after bathing:

℞ Rose water,
Glycerine, aa. f℥ij.
Borax, grs. xx.,
Salicylic acid, grs. vi. M.
S. Lotion.

When the sphincter ani has been divided, and the loose tissues in the vicinity much incised, the healing process leaves the sphincter-grip quite weak, and the folds of the anus considerably distorted. These states can not be wholly avoided, therefore the patient must be content with the assurance that the annoyance will grow less as time passes.

Some persons endure anal fistulæ for years without making an effort to get relief. Their excuse usually is that no method of treatment can be relied upon as radically curative; and the morbid state is not a source of much annoyance. An individual may pass along for a year or two without suffering much from an anal fistula; then, perhaps from the orifice becoming obstructed, an acute inflammatory state attacks the anal region and lays the patient up for a week or two: following this pathological storm there may be a long calm, or respite from misery. The relief seems to arise from a free discharge of purulency for a few days.

—the outburst may be compared to the eruption of a volcano that has been slumbering for a season. Not unfrequently may be observed marked phenomena in the organic world that seem to have a counterpart in the violent throes of the earth's forces.

HÆMORRHOIDS.

The region of the anus is quite vascular, though the arteries are not large. The hæmorrhoidal veins are numerous, tortuous, and dilatable; the latter condition gives rise to multiple tumors, called, in common language, piles. The pathological state consists essentially in an enlargement of the vessels in the anal region, and a plastic infiltration of the connective tissue. Hæmorrhoidal tumors situated at the verge of the anus outside the sphincter, have been denominated *external* piles; and those involving the gut within the sphincter take the name of *internal* piles. In many instances a hæmorrhoidal state of the vessels extends to the skin outside the verge of the anus, and some distance inside the sphincter, therefore the classification just announced would not be applicable to them. However, it is convenient to make the distinction in all cases that will admit of it.

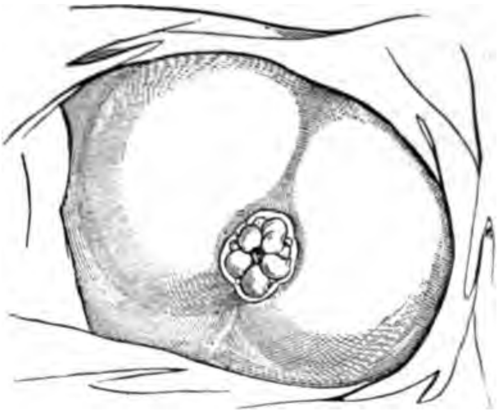
External piles consist of one or more tumors at the anal outlet, which are round in shape and blue in color, consequently they appear somewhat like purple grapes. At first they are chiefly composed of dilated vessels, but as the disease increases, the irritation leads to infiltration of the connective tissue and an expansion of the veins. By degrees, and at intervals, the swelling and induration increase, until the morbid state is sufficiently annoying to demand treatment. When the bowels are in a favorable condition, neither looseness nor constipation existing, and the anal region is in a quiescent state, external hæmorrhoids are not a source of constant annoyance; but let the stools become hard, necessitating straining efforts to pass them, or so liquid that several thin discharges occur in a day, and the pile tumors quickly take on such a congested and irritable condition that the patient is thrown into a violent state of suffering. The swelling leads to constriction of some of the vessels, so that an over-distended vein may burst, allowing blood to be discharged externally, or into the cellular tissue beneath the skin.

A paroxysm of inflammatory action which may last days or weeks, is usually succeeded by a season of quietude, during which very little suffering is experienced; yet, in time, a fresh paroxysm of excitement in the anal region will return, and thus years or a life-time may be passed in varying periods of renewed attack, seasons of decline, and intervals of quietude. When a hæmorrhoidal state has existed for some years, the pile tumors attain a degree of induration through infiltration and the organization of exuded lymph, that they never wholly subside, but become permanent structures. Although external hæmorrhoids are under consideration, advanced morbid states have been indicated in which the tumors may not be wholly covered with integument, but the deeper parts of the tumors have a covering of mucous membrane, and therefore partake, as has been said before, of the character of internal piles.

It is not uncommon to meet with a single pile tumor, and that may show itself only once or twice in a year, or while a lax or constipated state of the colon exists. In other instances three or four tumors are observed, ranging in size from that of a pea to a large grape, and all existing on the right or left side of the anal outlet; and in rarer cases, a dozen quite distinct hæmorrhoidal tumors may be noticed forming a circle around the anal border. On rare occasions I have been called to treat an anal tumor, hæmorrhoidal in character, which had attained the size of an infant's fist. Not uncommonly a partial protrusion or prolapsion of the mucous membrane occurs in connection with hæmorrhoids, both morbid states contributing to the size of the tumor. A varicose condition of a hæmorrhoidal vein is indicated by its intensely blue color, and by its grape-like shape, while a prolapsed, infiltrated and indurated mass at the verge of the anal orifice, which is not hæmorrhoidal, presents the hue of the integument of the region, and an irregular outline.

Piles, as has been stated, are chiefly produced by extreme states of the bowels as regards looseness and constipation; but they may be hereditary, inasmuch as mother and daughter, father and son, have frequently been sufferers from hæmorrhoids. Possibly the same habits exert the influence, or the same organic construction. Twenty years ago I knew a man advanced in life, who had suffered from piles since he was thirty-five years of age, and he had been a hard drinker. I knew his son who was about fifty, and he had suffered with piles ever since he was thirty-five—he was a daily consumer of a pint of whiskey. Recently a grandson reached the age of thirty-five, and he, too, has piles, but says he had no trouble of the kind until he acquired the habit of drinking alcoholic stimulants. Another grand-son who has reached the age of forty, with strictly temperate habits, has not suffered from hæmorrhoids. In this family it does not appear that piles were an hereditary disease, but drinking habits, or a love for alcoholic stimulants, which may have caused hæmorrhoids, were transmitted from sire to son. Morbid changes in the physical character of the liver, often brought about by excessive drink, may obstruct the portal circulation, and thus indirectly prove the active cause of piles. Acid materials in an undigested state, coming down from the stomach, may irritate the rectum, and so be instrumental in establishing a hæmorrhoidal state. Straining at stool is a common cause of piles, yet the expulsive efforts are excited by a constipated state of the bowels. Persons who, from the nature of their avocation, have to stand nearly all the day, are subject to piles; and those who sit most of the time are liable to the same disease. The presence of a pregnant uterus, and of ovarian tumors, produces hæmorrhoids; stone in the bladder also leads to a hæmorrhoidal state. Excessive venery is cited as a cause of piles; and I do not see why extreme continence might not operate in the same way. Hæmorrhoids which arise from scirrhus of the colon can not be relieved. Young persons rarely suffer from hæmorrhoidal disease, and the aged are less often sufferers than persons in middle life.

FIG. 220.



Hæmorrhoids.

The treatment of hæmorrhoids has a wide range in order to reach varying morbid conditions. Early symptoms may be allayed by attention to a regular evacuation of the bowels. A daily dejection directly after breakfast generally averts an attack of hæmorrhoids. Medicine is generally not necessary to produce a daily evacuation, but as simple a custom as the drinking of a glass of cold water before breakfast, often answers the purpose. The habit of inviting the bowels to act at a certain time every morning, may accomplish all that is needed. Those who are constipated by nature may have to take a laxative or purgative occasionally, or provoke a movement of the bowels by the use of enemas. The action of rhubarb upon sluggish bowels is mild and to be commended. Drastic cathartics are to be shunned in the management of hæmorrhoidal disease; in fact they will produce piles. Plain and easily digested food favors a healthy action of the alimentary track; whilst highly seasoned aliment in large quantities produces constipation and intestinal disturbances. Certain dried fruits, as figs and prunes, are moderately opening to the bowels. Sulphur in from five to thirty grain doses, taken with treacle three or four times a day, is a valuable agent to render the fæces soft, yet not liquid. The following compound I have prescribed with considerable success:

℞ Pulv. crab orchard salts, ℥iij.
" sulphur, ℥j.
" cubebs, ʒss. M.

S. Dose—from a quarter to half teaspoonful, in a half wine glass of water, three or four times a day, to improve digestion and move the bowels easily once or twice a day.

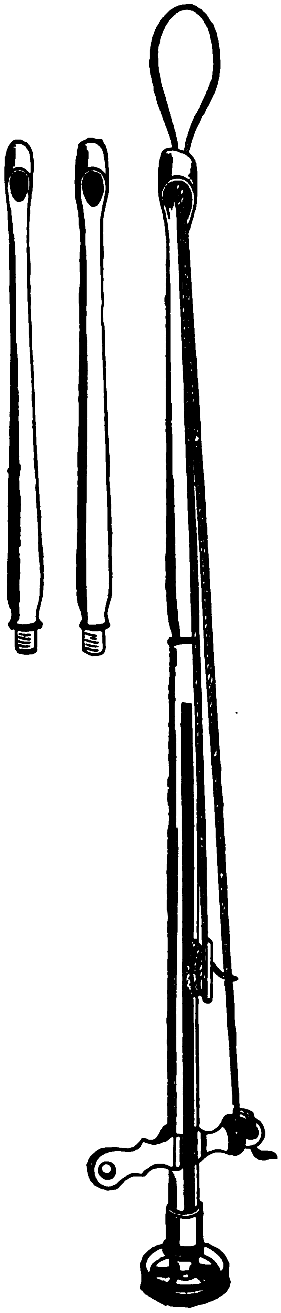
In torpid conditions of the bowels it is well to administer the compound podophyllin pill, for a few days. It is rare, however, that so active and disturbing an element is needed. A confection of senna is an old and not useless agent in the management of piles. It was once thought that the liver must be stimulated in order to effect a rapid cure of hæmorrhoids; and calomel and blue-mass were the medicines to do it, but experiments have proven that rhubarb is the most active of cholagogues, yet it will not cure piles as quickly as sulphur. Lacto-pepsine is excellent to promote digestion, and thereby to cure hæmorrhoidal states. The metaphorical direction of Dr. Rush, to "shake the gall-bladder," in the treatment of piles, has waned in influence as the potency of mercury as a cholagogue has been questioned.

Local medication has been regarded as an important factor in the treatment of hæmorrhoids; and not without reason, for the sore parts are within reach. Commonly an astringent and an anodyne entered all "pile ointments," for the reason, it is presumed, that an astringent action would make the tumors smaller, and the anodyne would assuage pain. According to the most approved knowledge on the subject, it is now believed that cold or heat greatly influences the morbid sensitiveness of inflamed or "acute" piles,—cold water when it is agreeable, and warm and wet applications if cold provokes chilly sensations. But as patients can not use water in this way and walk about, an unguent is often a necessity: and it is found that a narcotic can be used to advantage in combination with simple cerate. After it was ascertained that a fomentation of tobacco leaves reduced the sensitiveness of painful piles, stramonium was used in its place, and was found to be the better agent of the two. Fresh juice from the green plant is to be incorporated with lard or cerate, and then the compound scented with some agreeable perfume. The stramonium ointments of the dispensatories are made from the extracts, which are greatly inferior to the recently expressed juice of the green plant.

In the event the means mentioned have been used, and failed to give relief, the keenly sensitive tumor is to be examined; and if by its color and distension a strangulated state probably exists, the swelling it to be punctured or incised with a bistoury. This will let out the pent up fluid, and sometimes afford instantaneous relief. Leeches have been recommended highly in the treatment of acutely inflamed piles, but my own experience does not warrant a commendation of the agency. I have been called to patients in a state of agony and agitation on account of the pain endured from inflamed hæmorrhoids, and to temporarily calm the excitement, I have administered a moderate amount of chloroform by inhalation. I could thus quickly bring the patient into a condition to receive other agents, for instance, chloral hydrate. The subcutaneous injection of a solution of morphia near the anus while the patient is under the influence of chloroform, is a successful method of affording speedy and sometimes permanent relief. Considerable experience in the management of acutely inflamed and exquisitely sensitive hæmorrhoidal tumors has confirmed me in the belief that the pain must be reduced before the patient is satisfied with professional ministrations.

Chronic pile tumors that are liable to repeated inflammatory states, and which are annoying in many ways, may be safely excised if the pedicles or basal attachments do not involve too much

FIG. 221.



Ecraseur.

mucous tissue. Ordinary external piles may be raised or pulled outwards with forceps, and then snipped off with sharp scissors. The bleeding is insignificant, and the pain is not of an excruciating nature. If the patient be timid, or insists upon taking an anæsthetic, there is no serious objection to its administration. When the patient can endure the operation without an anæsthetic, he may place his knees in the seat of a chair, and lean over its back; but if an anæsthetic be administered the patient must rest on his side upon a bed or lounge, with the thighs flexed against the abdomen. It is to be borne in mind that it is not necessary to excise pile tumors very close to their bases, for, it mostly cut away, the remaining parts disappear by absorption. A tumor as large as a child's fist is to be removed with an ecraseur; or it is to be transfixed by sending a double ligature through it with a needle, and then strangulated in halves by tying extremely tight the ends of the ligatures. The cords should be hempen or well twisted silk, of a size to stand all the force a man can apply with his hands. On the second day the tumor may be excised close to the ligatures. If they do not come away in four or five days they may be cut and removed.

The organs of the pelvis are so intimately associated by plexuses of nerves, that a surgical operation performed upon one organ re-acts upon another, therefore the excision of pile tumors is not unfrequently attended with the temporary suspension of voluntary micturition. However, the application of heat to the hypogastrium usually restores the function. In rare cases a resort must be had to catheterism. The disturbance of the urinary organs is not so frequent a complication when external hæmorrhoids are excised, as when internal piles are cut away.

After the excision of pile tumors the patient is to keep his room, and perhaps his bed, for a few days. The application of a solution of salicylic acid to the wound is all the local treatment that may be necessary. When too much mucous membrane and tegumentary tissue at the verge of the anus are removed, the cicatrization may cause trouble by making the anal orifice too small. The prolonged use of caustics about the anal folds will result in a constricted and indurated state of the intestinal outlet.

The removal of pile tumors with a small ecraseur is well enough, but the plan has no advantages over excision with scissors, except that pertaining to hemorrhage. The ecraseur is considered a reliable safeguard against hemorrhage, yet I have known a brisk attack of bleeding to come on in a few hours after a portion of prolapsed rectum had been removed with that instrument.

Timid operators never excise pile tumors, but cauterize them with nitric acid, persulphate of iron, or other escharotic; or they may employ ligatures to strangulate the bases of such tumors as have a pedicle. I have employed the ligature in several instances, yet seldom with satisfaction. It is rare that the ligature wholly arrests the circulation, and a strangulated tumor gives off an exceedingly offensive odor, whether completely strangulated or not. The danger, when the ligature is employed, is from blood-poisoning.

A pile tumor, to be ligatured, should be pulled upon with forceps in order to develop the pedicle and make space for the application of a ligature. The thread should be small, yet strong. Horse-hair has been highly commended first and last, but I prefer hemp or silk. I have used ligatures for a day, and then excised the masses with scissors, in order to avoid the odor of putrid flesh.

Internal hæmorrhoids are more frequent and troublesome than the external variety. The symptoms in the early stages of the disease, are pain and heaviness in the anal region, with occasional hemorrhages while straining at stool. The sense of weight in the hips and pelvic region may come from other causes, but its presence should lead to an inquiry concerning the rectum. Pain in the sacral and coccygeal regions should be interpreted as a sign of internal piles. In the course of a few weeks or months after internal hæmorrhoids are first felt, the tumors will protrude from the anus at each alvine evacuation; and at length will come down while standing or walking. The protruded masses appear much like prolapse of the rectum, yet the difference is that in prolapsion the sphincters allow of complete inversion, while in internal piles the mucous membrane comes down in columns or compartments, exhibiting distinct tumors. When internal piles drop down and remain in a prolapsed or protruded state, the sphincters constrict the tumors, causing pain that is only relieved by a return of the piles, or a hemorrhage which relieves the passive congestion. Women with internal hæmorrhoids suffer in so many ways,—with flatulence, indigestion, pain in the loins and down the thighs, irritability of the bladder, and burning sensations in the uterus,—that their sufferings are often referred to that magazine of morbid phenomena, the womb. It is well, therefore, for a practitioner of medicine and surgery to be on his guard while examining a female patient who complains of many of the symptoms mentioned. It is so common to assign them to diseases of the uterus without duly considering whether that organ be wholly at fault or not, that serious diagnostic blunders are often committed.

Internal piles may be associated with the external variety, yet they frequently exist without marked signs exterior to the verge of the anus. But if the mucous membrane be examined, after the anus has been dilated, blue, tortuous, and distended veins will be observed, especially if the patient be asked to strain while the examination is made. An inexperienced observer might use the finger, an anal speculum, and dilators, in explorations instituted to discover internal piles, yet fail to find much unless he asked the patient to strain as if to evacuate the bowels or to make the rectum protrude. An effort of that kind usually brings into view the hæmorrhoidal masses.

Patients with internal piles are commonly great sufferers; they move around as if they were in distress, and their faces wear marks of deep and prolonged misery. They are dyspeptic, irritable, and despondent, and they are seldom radically cured.

When two or three quite distinct internal piles fill the anal orifice; and the anal apparatus does not seem to be greatly disturbed by their presence, the prognosis is not unfavorable. In fact, each tumor can be seized with polypous forceps, dragged into view, and excised with scissors. The operation is simple, and in no respect serious; but when large masses of hæmorrhoidal structure can be extruded from the anal orifice, or be brought into view by straining, the question of excision is worthy of profound consideration.

A condensed and thickened mass of hæmorrhoidal tissue in the rectum may be excised without much danger from bleeding, shock, or pyæmia; especially is great care to be exercised in the operative procedure and in the after treatment. But I have known the strangulation of such a morbid mass with the ligature, to be followed by startling paroxysms of pain, inability to pass urine, vital depression, delirium, and death.

The excision of several hæmorrhoidal masses of the internal variety, should not be practised at any one time; but the operative procedure should be divided by intervals of a few weeks or even months. To use three or four ligatures at a single operative procedure, would be exceedingly dangerous.

Operative measures for the relief of internal hæmorrhoids are so tedious, serious, and unsatisfactory, that all the more ingenuity has been displayed in the constitutional management of the disorder. If the patient leads an in-door and sedentary life, a radical change in the manner of living should be instituted. Moderate out-door exercise and a plain diet may accomplish wonders. Coarse bread, buttermilk, eggs, beans, pickled pork cooked in a variety of ways, cured codfish, figs, prunes, berries—in short, the usual diet of a farm-house—may effect such a change in the alimentary track of the invalid, that a complete recovery can be attained without medicine. Those who can not change their avocation should adopt the diet above indicated, and aid digestion with lacto-pepsine, nux vomica, Fowler's solution, iron, phosphorus, and well attested vegetable bitters. It is impossible to indicate an appropriate diet for every individual, or to prescribe the identical remedy which shall suit every dyspeptic, but if the food and the medicine be indicated in a general way, the ingenuity of the medical practitioner will ascertain the special applicability. The patient, after receiving instructions and suggestions in dietetics, becomes an expert in managing his own peculiar case. All patients with the same general disease do not recover, or even thrive on a single course of diet and medication.

The bowels of a patient troubled with internal piles, should never be allowed to become constipated, or to get into a condition necessitating straining efforts. Many persons afflicted with internal hæmorrhoids always use an enema of water before each stool; and if they would inject a moderately dilute form of the fluid extract of pinus canadensis after each alvine evacuation, the influence would be decidedly beneficial.

If an attack of diarrhœa come on, it should not be restrained with opium and ordinary astringents, but a solution or infusion of the extract of logwood,—warm water and heat being employed in making the solution,—should be swallowed in table-spoonful doses every four hours, until a proper state of the bowels is attained. Opiates and cathartics exercise a baleful influence upon internal piles. A confection of black pepper mixed with a confection of senna, produces a favorable impression upon internal piles, slowly healing fistula, and fissure of the anus. A confection of sulphur and cubebs is also of use in treating patients with internal hæmorrhoids. The occasional use of cayenne pepper on food may exert a beneficial influence upon hæmorrhoidal states. Piperine embraces the essential principle of the pepper class of remedies, but it does not act as favorably upon a prolapsed anus, when taken internally, as crude cayenne.

When internal piles become decidedly hemorrhagic, it has been customary to employ astringent injections, as solutions of lead, zinc, iron, tannin, galls, etc., but I prefer to give the extract of logwood internally and pinus canadensis as an enema. The use of hamamelis, systemically and topically, has been lauded unreasonably as a specific in the treatment of external and internal piles; but in practice I find the agent has no very decided or positive qualities. I used witch-hazel long before the agent appeared in Homœopathic literature, and feel justified in saying that it is a pleasant remedy of some value in the treatment of hæmorrhoids.

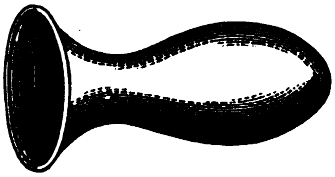
If internal piles get into a highly inflamed condition, and a descent of the tumors appears to be the exciting cause, the patient may take chloroform, and have the protruded parts pushed back into their proper place. Sometimes the patient can undergo the reduction without an anæsthetic,—he may do it himself.

In an aching and inflamed state of the rectum after protruding piles have been returned, suppositories of opium have imparted great relief. This manner of administering anodynes when the distress is in the pelvic region, is preferable to sending them through the stomach. If a suppository is used after a pile tumor has been excised, it should have a grain of salicylic acid incorporated with it to act as an antiseptic.

After excising the internal piles of a female patient, the anodyne suppositories may be introduced into the vagina instead of the rectum. Painful states of the bladder or anus in the female may be controlled by the use of anodyne suppositories in the vagina. Women bear losses of blood in bleeding piles and in operations upon the anus better than men. Perhaps the periodical hemorrhages females undergo establish a custom or habit which operates favorably when much blood is lost from the pelvic viscera. I have excised internal piles in female subjects without a serious accident; but in two instances, after operating on men, the results were disastrous. The first was the case of Dr. Prince, who came to the city with the avowed purpose of having some troublesome internal piles excised. I advised a contrary course, but he was decided in his notions. In two hours after four or five tumors were excised, the patient could not pass his urine. The inclination to urinate was very teasing, but the use of a catheter proved there was no urine in the bladder. The shock of the operation caused an arrest of the functions of the kidneys, and in two days the patient died of uræmia. Within a few months of this fatal issue, I ligated two large internal pile tumors for Mr. Merrie, a merchant of Cincinnati. The paroxysms of pain that followed the application of the ligatures were fearfully agonizing, chloroform alone being powerful enough to subdue the severity of the distress; and in spite of all efforts to rally him from a vitally depressed state, he died in three days after the operation. The health of the gentleman had been delicate for years,—liver and kidney difficulties incapacitating him for business on many occasions. While the operation may be looked upon as the immediate cause of death, there were remote influences at work which would have terminated fatally in a few months. Dr. Prince had suffered from a urinary difficulty for many years, being obliged to take to the bed and employ a catheter on several occasions.

In some cases it is well to try the effect of nitric acid upon protruding internal piles. To have the agent most efficient it should be of concentrated strength, and applied with a pencil or spatula of wood. The end of the pencil is to be dipped in the acid, and then held a minute till it is dry before application. The stick is to be placed against the tumor in one spot, and then turned over and pressed upon another part of the lump. The sensation is keen at first, but soon passes away, though leaving the parts a little sore for two days. A repetition of the cauterization may take place every fifth or sixth day. The effect of the caustic is to stimulate absorption and contraction of the pendulous and prolapsed hæmorrhoidal masses. When a pile tumor is quite large and indurated it is useless to attempt to drive it away with nitric acid. Such a morbid mass should be subjected to the ligature or scissors. In cases especially adapted to the nitric acid treatment, the results are quite satisfactory; the pain is not severe except momentarily, and the patient can attend to business while under treatment.

FIG. 222.



Self-retaining leaden plug.

I have attained considerable success in the treatment of internal piles by the use of a self-retaining leaden plug; the instrument is hollow, therefore not heavy, and so shaped that it will stay in place by the grip of the sphincter ani muscle. After being oiled, the instrument is easily carried into the rectum, and its flaring outer extremity prevents it going too deep into the bowel. The patient can sit down while the instrument is in place and not realize that it is present. It is readily removed when an evacuation of the bowels is demanded. The instrument was designed originally to cure prolapse of the anus.

FISSURE OF THE ANUS.

The mucous membrane just within the anal aperture, is liable to an ulcerated state which generally bears the name of fissure of the anus. The elongated ulcer is generally found in or near the posterior commissure of the anus, a pile tumor often existing by its side. The fissure can not be seen unless the patient strains downward while the anal aperture is dilated with instruments or digital pressure. The examination may be conducted while the patient bends over the back of a chair, and rests the knees in the seat. The exposure should be made in a good light, and the exploration should be thorough. Unless the examiner can see deeper than the tegumentary folds, the ulcer may escape detection. The sore is like a large crack or chap seen on hands exposed to the harsh winds of winter. It is very sensitive, consequently few patients will allow a surgeon to make a satisfactory examination.

Fissure of the anus is oftenest found in adults who have eczema or a syphilitic taint. Women are more subject to the disease than men; and the apparently robust of either sex are not exempt. Probably the dyspeptic and the cachectic are most liable to the complaint.

Anal fissure is restricted to circumscribed bounds, yet is one of the most distressing of diseases. The pain is not confined to the limits of the ulcer, but extends to the pelvic viscera, and even affects the entire organism. A man afflicted with fissure of the anus seems to be mentally and physically incapacitated for business. A despondency attends the disease which is fearfully demoralizing. Victims of anal ulcer have been driven to suicide. The keen distress that accompanies defecation is followed by great vital prostration. Sometimes the urine is voided with difficulty; and it drops a heavy sediment upon standing awhile. The fæces are pinched into a ribbon on account of the paroxysmal grip of the anus while defecation takes place. Palpation detects a hard ring in the anus which is caused by the rigid contraction of the sphincter; and an attempt to introduce an oiled finger into the anus and rectum is resisted, or attended with cries of agony. A woman having fissure of the anus details symptoms that are liable to deceive the inexperienced; she will complain of frequent micturition, scalding of the urine, heat and bearing down in the vagina and womb, pain in the loins and limbs, and of a variety of disturbances that might lead even a gynæcologist to suspect that an ulcerated os and cervix uteri probably embraced the major part of the morbid action. But if the patient can be made to say that she often passes the season and inclination to defecate because an attempt at evacuation of the bowels is attended with distress, and that an effort at stool whether effectual or not, is followed by such vital prostration that she has to go to bed for an hour or two, there is reason to believe that a fissure of the anus exists; and a time should therefore be appointed for an exploration of the anal apparatus. Some women are so averse to an examination that they will endure torture for years before submitting to the only means of establishing a correct diagnosis and of effecting a cure. A female while undergoing an examination may rest upon one side or the other, with the thighs flexed upon the abdomen. She is requested to strain downwards when the folds of the anus are dilated with instruments or rolled out by the aid of fingers. The fissure may then be seen in the posterior commissure of the anus by the side of a tumor the size of a currant or a pea. The crack is about half an inch in length, and very red. Its surface presents very little, if any, pus, but easily bleeds. If it be more than half an inch in length, its inner extremity can not be seen. A speculum does not expose the fissure well, for the instrument pushes the structures inward as it enters, and often provokes more or less hemorrhage. In some instances the ulcer is not larger than a kernel of wheat, but the action of the sphincter keeps it in an irritable state. Patients suffering from fissure of the anus may have observed blood and pus on hardened fæces, a circumstance of some diagnostic value. However, in the majority of instances the nature of the disease is not suspected until the surgeon calls attention to the symptoms, or has demonstrated it by an examination. In some cases I have found it difficult to convince patients that they were the victims of anal fissure.

Small ulcers in the anal folds, and not influenced by the action of the sphincters, are quite a different disease from anal fissure, and rarely cause much distress. They may have been produced by scratching or rubbing the parts. A simple ointment may be all the treatment they require, while anal fissure is not improved by an unguent.

The following recipe calls for ingredients which make an excellent unguent for itching of the anus that comes from eczema and forming fissure:

℞ Simple cerate, ℥ij.
Common tar, ℥ss.
Fowler's solution, fʒj. M.

S. Use the ointment as deep in the anal folds as practicable, twice a day.

The treatment for fissure of the anus is chiefly local, yet much can be gained by constitutional remedies. The diet of the patient

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a few hours previous to the operation. Nothing is to be done to the wound for two or three days, except to keep a wet compress to it. Sleep may be secured the first night with the aid of chloral. The pain comes from the wound, and is vastly more endurable than that attendant upon the fissure. On the third day after the operation the following ointment may be pushed into the folds of the anus with a small swab:

℞ Stramonium oint., ℥ij.
Borax, grs. x.
Salicylic acid, grs. v. M.

If the bowels do not move on the fourth or fifth day, a saline cathartic may be employed to provoke an evacuation. From that time forward a full yet simple diet may be employed; and sulphur in sufficient doses to render the stools soft and pasty. In a few weeks the patient will be entirely relieved of one of the most distressing of maladies.

ANAL PROLAPSION.

While the bowel is normally evacuated the mucous membrane is temporarily extruded, but is immediately withdrawn as soon as the expulsive effort of defecation is over. When the horse defecates there takes place marked extrusion of the rectum, yet the functions of the anal apparatus soon return the extruded folds.

Children and old persons are liable to a protrusion of the anus, rectum and lower part of the bowel, the prolapsed mucous membrane forming a mass of folds outside the anal orifice. The difficulty may come on gradually, or quite suddenly; but generally as an attendant of diarrhœa. Partial paralysis of the anal apparatus is a common cause of prolapsion. I have been told by many patients that they could not defecate without digital assistance; and after a dejection the protruding bowel had to be returned by manipulation. A movement of the bowels under such circumstances must be a serious burden. Prolapse of the anus is frequently hereditary, one generation after another suffering more or less at some period of life. Children at the teething age, when digestion is feeble and diarrhœa is a complication, are apt to be troubled with anal prolapsion. In many instances the mother places a greased cloth against the protruded anal folds, and by gentle pressure returns the mass within the anal orifice. The manipulative act is not difficult to execute, especially when performed soon after the protrusion occurs.

Elderly persons are occasionally met who have suffered for years with prolapse of the anus. I recently examined a woman sixty-five years of age who had a tumor of the anus as large as the fist, which could not be returned. She said the protruding mass could be returned for a number of years, but at length it became so large and sensitive that attempts at reduction failed. From that time the tumor gradually enlarged until the morbid mass could not be returned. The tumor was of a dusky hue, but did not bleed nor secrete much mucus. That which had been mucous membrane had become somewhat tegumentary in appearance. Such organic changes had taken place in the protruded folds of intestine, chiefly from plastic exudation and consequent induration, that reduction was utterly impracticable. Neither could the morbid mass be safely excised, therefore treatment was useless. The bowels were unloaded from time to time, more by manual dexterity than by defecatory expulsion. From the proximity of the womb and bladder to the diseased anus and rectum, the entire pelvic viscera were in a state of paroxysmal suffering. There was pain in the loins and thighs, and the patient was troubled with flatulence, poor digestion, and fits of despondency. In describing this case the leading features of anal prolapsion have been depicted. Generally the disease is arrested before it attains the maturity here detailed, yet, if left to itself, the same degree of disorganization may be expected. The worst phases I have observed in women; and it is not improbable that an instinctive aversion to the examinations necessary to effect a cure contribute to the advanced morbid states. Men are less patient under suffering, and more persistent in their determination to be relieved.

Prolapse of the anus is generally curable in children,—the treatment consisting in a return of the prolapsed mass as soon as it occurs, and the administration of remedies calculated to improve the general health. The aim of the practitioner should be to keep the bowels from being either loose or constipated, and to see that the food is easy of digestion and withal nutritious. Bread and milk constitute the best general diet for children; though rice, maccaroni, and vegetable soups may be occasionally taken. If the bowels be constipated, sulphur and molasses should be administered every second day; but if loose, a solution of the extract of logwood may be employed with signal advantage. In the event that the anal apparatus is very lax, a prolapsion taking place without straining at stool, a pad and bandage may be worn until the tendency to eversion on the part of the anal folds is overcome. The injection of a fluid extract of pinus canadensis, two or three times a day, has proved a decided benefit in bad forms of the disease. Solutions of the salts of iron, zinc, and lead, are less curative when used as injections than the agent recommended.

Persons advanced in life, who may be troubled with prolapsus ani, should give great care to diet and a comfortable condition of the bowels. Cracked wheat, rye bread, beef-bone soups, boiled fish, stewed wing of chicken, soft-boiled eggs, crackers, rice, maccaroni, the fatty part of boiled ham, raw oysters, broiled venison, tripe, baked potatoes, peas and beans in their season, cooked fruits, and a variety of nicely prepared dishes that the observation and ingenuity of the patient or friends may dictate or suggest, are to be employed, ever keeping in remembrance and avoiding what experience has proved to be injurious. Every person is more or less a law unto himself, so far as diet may be concerned.

The medication of adults who suffer from anal prolapsion need not necessarily differ essentially from that indicated for children. However, as grown persons oftenest have their disease aggravated by feeble digestion, flatulence, constipation, and depression of spirits, special regard must be had for those conditions. Lacto-pepsine, acid solution of iron, nux, rhubarb, sulphur, quassia, piperine or crude pepper, peppermint, pennyroyal, horse-radish, sulphate of magnesia, and several of the well known mineral waters, constitute some of the best remedies for overcoming atony of the stomach, flatulence, and constipation; and when much has been accomplished in overcoming these states, the paroxysms of despondency will vanish.

And while considerable can be attained by a rational course of dietetics and general medication, not a little good can be accomplished by judicious local treatment. The use of stramonium ointment made from a fresh extract, often is attended with signal relief. The unguent should be applied to the protruding anal folds before they are returned, and to the anal apparatus after each defecatory act. Enemas of water just before an evacuation liquefy the fæces and otherwise contribute to an easy evacuation without the need of straining. The wearing of a pad and bandage affords much relief to some patients. The employment of the anal plug, devised for the cure of internal hæmorrhoids and

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Stricture of the rectum, or sigmoid
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ble without suffering. The bowels should be kept in a soluble condition, and evacuations induced with regularity. Women are more liable to strictures of the colon, rectum and anus, than men; and they often suffer tortures without giving their medical adviser an opportunity to diagnose the difficulty, or to treat it properly when once understood.

Stricture of the rectum generally occurs at a point about an inch and a half above the anus, though not unfrequently the strait exists at the depth of three or four inches. The nearer the anus it is the easier it is to manage, though it can not be said to be the more curable. If it be near enough to the anus to be brought under the influence of a self-retaining plug or dilator, a radical cure is possible.

Stricture of the anus and rectum is occasionally attended with deep fissures in the anal orifice and complicated fistulæ. Through the false passages more or less fæcal matter finds escape, rendering the patient exceedingly uncomfortable. Great irregularity of the bowels attends anal strictures, seasons of diarrhœa and constipation alternating. I have met with two or three cases in old women in which the greater part of the fæces found their way into the vagina through a recto-vaginal opening that had formed in consequence of a stricture of the rectum or anus. The afflicted were too far advanced in life to undergo operative interference for their relief.

A muco-purulent discharge, and an occasional tinge of blood, in connection with an alvine evacuation, lead to the suspicion that a stricture of the rectum exists, though similar discharges come from internal piles and other organic changes in the lower intestine. Sometimes the muco-purulent fluids pass in advance of the fæces, and when they do, there is evidence that the stricture retards the descent of the feculent matter. An accumulation of purulent fluid below the stricture is attended with considerable uneasiness. Not unfrequently an ulcer of the colon or rectum exists in connection with stricture of the bowel, consequently the case is complicated and dangerous. The use of a dilator, or large bougie, may afford considerable relief in some instances, and conduce to a cure in others. Sitting for a while in a tub or basin of warm water has been known to afford the most agreeable relief, when a stricture of the rectum gets into a spasmodic state. A suppository of opium has also a happy effect in some instances.

The injection of a quart of warm water into the rectum has been known to effect temporary freedom from distress.

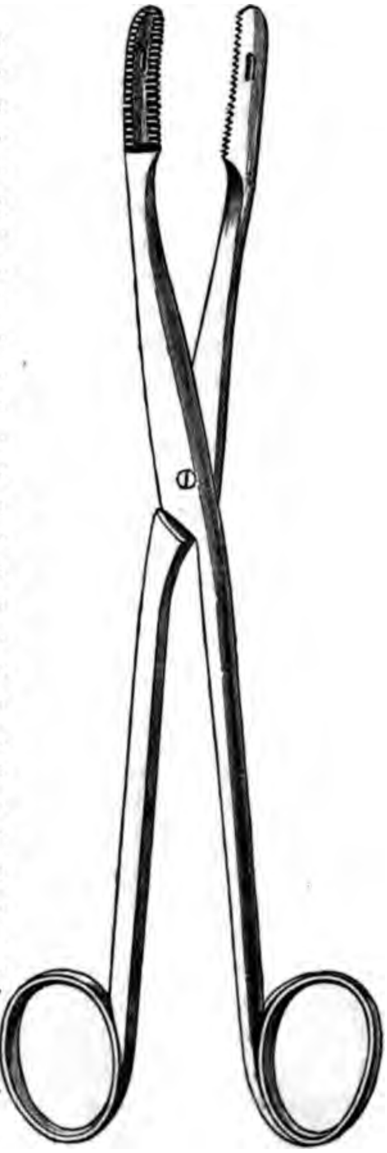
Stricture of the anus produced by cicatrices following the excision of piles, is generally rather obstinate, the contraction returning again and again after having been overcome with dilators. A common rectum bougie can be made to dilate the anus; so can a glove-finger stretcher, and many other implements. Molesworth's "Climax Dilator" is well adapted to the operation. Persons suffering with stricture of the rectum or anus rarely obtain a radical cure; but they may hope for that degree of relief that is free from a teasing annoyance. Strictures of the lower part of the intestinal canal, with orifices not larger than a goose-quill, may be burst with Maisonneuve's urethral instrument, or with any other implement that will execute a rupture of the contracted band. After the laceration has been effected, a rectal plug can be worn for a few weeks to secure a dilated state.

In the event that the anus has no elastic covering, but is lined with inodular tissue that tends to contract, and will not yield to dilating forces, it is well to perform a plastic operation, transferring, by a twisting and sliding process, a flap of healthy skin from parts adjacent to the anal orifice. The transplantation of two flaps a half inch wide will generally afford all the elasticity needed. The use of belladonna and other relaxing unguents will do no appreciable good.

POLYPUS OF THE RECTUM.

A somewhat rare disease of the rectum is the development of a polypoid growth from the mucous folds just within the anus. In structure polypus of the rectum does not differ essentially from that form of disease which is met with in the womb. In texture and consistence it is fibrous and soft, and rarely gelatinous as those encountered in the nose. The pedicle is small, and may have two points of attachment. The lower extremity of the tumor may reach the size of a plum, and present a yellowish white or pinkish hue. Not much pain attends the growth of a polypus of the rectum, but its presence may provoke hemorrhage, or produce annoyance by protruding into the anal orifice. Sometimes the existence of the disease is first discovered by the presence of the lower extremity outside the verge of the anus. Even then the patient may suspect he has prolapsion of the bowel, or a hæmorrhoidal tumor. A feature of polypus of the rectum is that the tumor is rarely sensitive, and gradually attains greater and greater length. When first noticed it may not appear outside the anal orifice oftener than once in a week or two, but in time its bulbous extremity never returns within the sphincters unless replaced with the fingers.

FIG. 223.



Polypous forceps.

When polypus of the rectum is suspected to exist, and no tumor appears outside the anus, the patient should be examined immediately after stool, or a straining effort as if to expel something from the bowel. Especially should this be done when the patient is a child, and a show of fresh blood every day or two indicates that a polypus may exist. Diseases of the anus and rectum are so numerous, and the symptoms are so near alike, that it requires much diagnostic acumen to distinguish one morbid condition from another. Practitioners of little experience or of careless habits in the diagnosis of pathological states, frequently commit great mistakes when called to treat diseases of the rectum. They rely too much upon what the patient says, and neglect to observe for themselves. They fail to appreciate the truth in the maxim, "it is hard to be right, and easy to be mistaken." I once was called to a woman who "had suffered many things of many physicians;" the cervix uteri had been cauterized, hæmorrhoids excised, and fissure of the anus incised. Before finishing an examination of the pelvic organs, I pushed a forefinger as deep as possible into the rectum, and asked the patient to strain downwards at the same time. The digit encountered a tumor which, when forced quite low in the rectum, proved to be a polypus. Its attachment was higher than usual, hence its long existence before discovery.

The treatment for small polypi of the rectum is avulsion after the pedicle has been twisted by seizing the bulb of the tumor with forceps and revolving the instruments until it is safe to make traction. If the peduncle remain behind, a new polypus rarely springs from it. If the foot-stalk be large, it may be best to ligate the pedicle and excise below with scissors. An ecraseur can not be used to advantage in the rectum, yet when the instrument can be employed, there is no objection to its use. When real polypi have existed, and not pendulous tumors of another character, I have always succeeded most satisfactorily in removing them by twisting and traction. The pain attending the operative procedure has not been great, nor has the hemorrhage been considerable.

A pendulous tumor of the rectum which may be deemed polypoid, may have too large and firm an attachment to admit of avulsion without serious risk. In such cases it is well to drag the tumor downwards, transfix it with ligatures, and strangulate its narrowest portion in parts. If an ecraseur can be employed, it is preferable to ligatures. The dangers attendant upon ligation have been alluded to in connection with the treatment of internal piles.

FOREIGN BODIES IN THE RECTUM.

Occasionally a fragment of bone or other hard substance which has been swallowed accidentally, will lodge in the rectum, after passing safely the alimentary track to its outlet, and there create disturbance. Hardened fæces may become impacted in the rectum, and have to be removed with the handle of a spoon or other mechanical means. I once removed from the rectum a splinter of beef bone an inch in length, that had been swallowed by a man who was in the habit of bolting his meals. He remembered having swallowed a piece of bone with some soup, but had no idea that the fragment was so long. One extremity of the osseous splinter was sharp, and transfixed the walls of the rectum, just above the sphincter. Its presence caused great distress, and prevented defecation. After dilating the anus with retractors employed to dilate wounds, I seized the foreign body near its upper extremity, and by forcing it upwards, disengaged the lower and sharp end, so that removal of the bone became easy.

Concretions are said to form in the rectum, but no case has ever come under my observation. Fruit stones, pins, needles, and fragments of oyster shell frequently find lodgement in the rectum. The best instrument to use in exploring the lower extremity of the intestinal track is the finger; and if necessary the entire hand can be passed through the sphincter while the patient is under an anæsthetic.

Persons with perverted moral and intellectual faculties have been known to introduce foreign substances into the rectum, such as smooth pebbles, vials, pencils and candles. In one instance I was called to remove the fragments of a broken vial from the rectum of a hysterical female.

The *Boston Medical and Surgical Journal*, for 1855, contains the account of a man who, by accident, sat down upon a tin tumbler three inches and a half long, and three inches in diameter. The drinking cup was forced inside the sphincters, and then ascended to the colon. Forceps and blunt hooks were employed to extract the foreign body, but without avail. A surgeon introduced his hand and arm inside the colon, through the anus, but could not extract the foreign body, though he brought it into view. Air pressed the cup upward again, and the patient was left to his fate. He died in three days after the accident.

Dr. Hazelhurst, of Georgia, reports in the *American Journal Medical Sciences*, 1852, that he removed two hundred and eighty plum stones that had lodged in the rectum of a negro. The finger and forceps were employed in the delivery of the stones, one by one.

Dr. Horace Nelson, in the *Northern Lancet*, for 1852, relates the case of a man who, while defecating, received the horn of a cow in his rectum, and five inches of the bovine weapon broke off, and lodged in the bowel. The foreign body was successfully removed, and the patient recovered.

Maisonneuve, Cloquet, and Dupuytren, report having extracted a tumbler, beer-glass, and preserve-pot, from the rectum, each in the order named. Cloquet broke the beer-glass in attempts to extract it with forceps, and the patient died in the course of a few days.

Dr. Harris, of Virginia, was called to a man who had introduced a glass flask into his rectum to cure a fit of piles. The oval bottle slipped above the sphincters, and could not be expelled. Dr. H. used a pair of small obstetrical forceps in attempts at delivery, but broke the flask into fragments. He then safely removed the fragments with his fingers. The man recovered.

Bushe, in his work on the rectum, relates the case of a monk who, to get rid of a violent colic, introduced into the rectum a long bottle, through the cork of which a perforation had been made to allow some water from Hungary to flow into the bowel. The foreign body soon got beyond reach, and a *sage femme* was engaged to deliver it, but she failed; but a boy eight or nine years of age managed to insert his hand deep enough to reach and remove the bottle.

The *Lancet*, for 1847, contains the account of a man who fell heavily upon the post of a chair, and a piece of the same perforated the rectum and bladder, in consequence of which the patient eventually died.

I once made a professional visit to a man, Mr. Winn, who fell in the barn, and struck upon the pointed end of a cart-stake. The wood entered the rectum, and reached eighteen inches in depth. Much blood followed the withdrawal of the stake, and considerable peritonitis had to be contended against, but the patient recovered in a few weeks without even exhibiting a very grave set of symptoms. The walls of the rectum are frequently punctured with the nozzle of a syringe or bougie, and death, in several instances, has followed the accident.

CANCER OF THE RECTUM.

Malignant disease of the rectum, when at an advanced stage, is easy to diagnose, but difficult to improve. In most instances the patient dies one of the most distressing of deaths. Life has been prolonged by making an artificial anus in the colon, but the final issue is as certain as if the bowels had not been unloaded in any such way.

In the early phases of cancer of the rectum, the symptoms so resemble internal piles, and fissure and stricture of the anus, that the disease may exist sometime without its real nature being suspected. If a finger be introduced within the rectum, a series of indurations or nodules may be discovered, but it is not always safe to declare the disease malignant on such testimony alone.

But when the morbid condition becomes aggravated by ineffectual attempts to move the bowels, the pain attending efforts at defecation increases, and an imperfect stool is accompanied with a gush of blood, then the indications of cancer are quite marked. As the disease progresses, the general health seriously suffers. The patient loses strength, has night sweats, chills, indigestion, flatulence, and great heaviness in the pelvic region. So prone is cancer to involve structures adjacent to those first attacked, that a malignant disease of the rectum will not long exist without invading the prostate, vesiculæ seminales, and root of the penis in the male, and the vagina and uterus in the female, consequently a complication of genito-urinary difficulties of a serious character, may be expected sooner or later.

The warty and fungoid growths that are about sure to appear in the anus soon after cancer of the rectum is established, should not be considered hæmorrhoidal, and subjected to caustics or excision, lest the disease be aggravated by the untimely interference. A very annoying complication during the progress of malignant disease of the rectum, is retention of the urine; then, again, an impaction of fæces in the bowel above the cancerous growth may be attended with ulceration that breaks down the barrier between the gut and bladder, and a filling of the bladder with feculent matter. To liquefy this so the urine can pass is often a difficult undertaking. A double catheter that will admit one stream and return another, washes out the more solvent parts, but the instrument is liable to frequent obstructions.

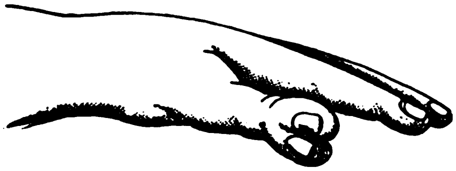
When the rectum gets entirely occluded with cancerous growths, it is very difficult to get a bougie or catheter through the mass without provoking profuse hemorrhage. While a passage-way can be effected, a dilator can be used, and enemata employed. At length, however, every resource fails, and the patient dies miserably. The course of the disease is from six months to three or four years. During the early stages of the disease, arsenic administered in small doses, checks the progress of the malady, but at length the remedy loses all power over the disease. Locally the chloride of zinc paste can be used through a vaginal syringe of vulcanized rubber, the caustic in a liquid state being carefully injected through the perforations after the end of the instrument has been crowded into the malignant mass. If the caustic comes in contact with the healthy tissue below the seat of i

SECTION XIX.

DISEASES OF THE LIMBS.

THE upper extremities are subject to various distortions or deformities which arise from diseases of the nerves, muscles, tendons, and fascias, and sometimes from the bones and joints. Children are occasionally born with a radius or ulna alone in the forearm; and the defective extremity may be tipped with a single digit, or two or three distorted fingers. In rare instances may be met a thumb with two nails, which have as a basis double terminal phalanges on the pollex. This is not a seriously objectionable defect; and if one part of the division be smaller than the other, as it commonly is, this may be amputated so dexterously that the remaining part shall exhibit no deformity. In two or three instances I have removed the superfluous part of a double thumb. If the distal extremity of the second phalanx be too broad, after the redundant dactyl is removed, a wedge-shaped piece may be chipped off with scissors or bone pliers.

FIG. 224.



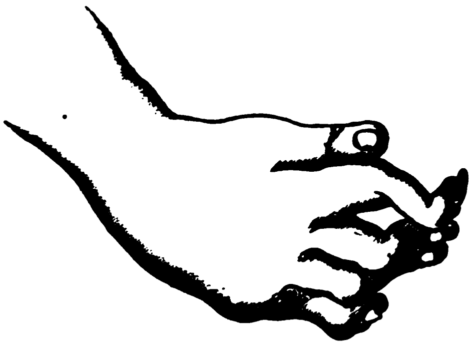
What is the primary cause of these deformities of deficiency and redundancy, it is impossible to conjecture. It has been surmised that a "maternal impression" was the origin of the first case, and that afterwards, if the defect appeared in a succeeding generation, it might be regarded as hereditary. While I do not deny that a vivid mental impression made upon the mother's mind during the early months of pregnancy, generally rendered intense by fear, may mark the unborn child, I am inclined to believe that in most cases of deformity, such as have been alluded to, there was primarily an arrest of development, or a perversion of constructive power in the nerve-centers while they were undergoing those changes in embryogony which correspond to the evolution of the young of the lower animals. Not that a child's hand, as typically laid out, can be converted into a fin, a wing, or a paw, but when it is perverted a compromise, so to speak, may take place, and not result in a well defined limb of any kind. It can not be successfully denied that a lapse occasionally takes place in embryogony, which admits the features of a lower form to appear; then, again, there may occur the exhibition of an attempt to take a *saltus* forward or upward, yet without accomplishing any thing advantageous to the individual. If it were not for these evidences of slackened activities in the creative forces, and the manifestations of forward reaches in animal evolution, it would be difficult to account for varieties and species.

There are several families in Europe, and descendants of them are in America, which exhibit a supernumerary little finger in some of the males of every generation; and when the redundant digit is excised in infancy for several generations, it finally disappears. And in such of those families thus marked who do not have the redundancy lopped off as fast as it appears in a new generation, the peculiarity has exhibited its persistence even to the tenth of lineal descendants. The defect must have come on accidentally, and it may be eradicated by having the redundant digit sacrificed as fast as it appears. Often the supernumerary little finger has little except a nail and a terminal phalanx, the connection with the ulnar side of the hand consisting of little more than a tegumentary pedicle. A solution of continuity may be effected with a horse-hair or a silken ligature. Where the connection of the supernumerary digit is by a joint, the separation may be produced by disarticulation, just as a finger is amputated at a metacarpo-phalangeal junction.

One of the commonest defects pertaining to the fingers is contraction of one of the digits through injury of a nerve, fascia, or tendon. In several instances I have known women engaged at laundry work to have a pin or needle forced into a finger, and the punctured wound to be followed by the gradual flexion of the digit injured, with anchylosis of the phalangeal articulations. In such cases, if the nail of the contracted finger reach the hollow of the hand, its growth and irritation are attended with incurable ulcers at the point of contact. I have been obliged to amputate such fingers in a few instances, in order to get rid of the annoyance. In one instance the sufferer overcame the greater part of the trouble by wearing a silver cap like a thimble, on the end of the contracted finger. The annoyance does not wholly come from the presence of the nail, but the flexed finger is in the way of grasping implements made to be held in the hand.

Subcutaneous tenotomy has been employed with marked success upon contracted tendons in the lower extremities, but the remedy often fails when applied to the contracted tendons of the hands and fingers. If the feet be rendered so nearly normal that the individual can stand and walk upon the soles, restricted mobility which may follow the straightening process, is not so serious a defect as the same amount of rigidity which might remain in a hand that may have undergone a tenotomy operation. The beauty and usefulness of the hand depend largely upon the flexibility of the extremity. Then, again, it is found that the subcutaneous division of tendons in the hand is followed by a greater degree of rigidity than similar operations performed upon the foot.

Fig. 225.



Fingers distorted by the cicatricial tissue of burns are seldom restored to full functional capacity; and if they be rendered stiff by crushing injuries, they rarely can be made pliant and useful. Tooth wounds of the phalangeal articulations are liable to result in anchylosis, and all the trouble that may attend such a state. It is proverbial that a stiff finger is always in the way.

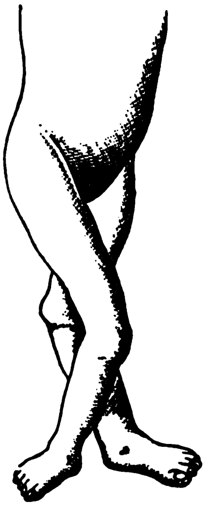
[illegible] of the fingers from rheumatic influences and gouty [illegible] the joints, is a defect often encountered, and rarely [illegible] rheumatic affection may come on early in life, but [illegible] concretions seldom form until the age of forty or fifty. [illegible] rheumatism coming on during adolescence, is liable to [illegible] the elbows, wrists, and finger joints, therefore during the period of convalescence, care should be exercised that no unne[illegible] contractions and anchyloses occur. Passive motion imparted during the recuperative stages of the disease may prove of immense value in retarding or overcoming a tendency to articular rigidity and stiffening of the tendons, fascias, and ligaments. Gouty concretions in individuals of advanced life can rarely be removed; nor can the rigid state of the fingers they induce be made to improve. In the event that the gouty diathesis can be overcome or greatly modified, an attempt to restore motion to the stiffened joints would be justifiable. Articular movements should be forced while the patient is in an anæsthetic state; and the mobility gained may be permanently secured by passive motion. However, the degree of inflammation following the violence offered to the diseased joints, may result in increased rigidity. The experiment can be tried on one joint first; then, if any advantage should be obtained, others might be subjected to the same up process.

DEFORMITIES OF THE LEGS AND FEET.

The muscles of the legs may become so unbalanced by diseases [illegible] that part of the spinal cord from which the crural nerves spring, that the limbs exhibit strange relations to one another. [illegible] some instances the legs twist around each other, and thus also [illegible] prevent locomotion. The worst of these deformities may [illegible] admit of a perfect cure, yet they may be wonderfully im[illegible]ed by tenotomy. Some years ago, I was solicited to operate [illegible] a son of Henry Andrews, of Covington, Ky. The lad was [illegible] six years old, yet was unable to stand or walk. His legs [illegible] thighs were so strangely contorted that it required an effort [illegible] the limbs through their entire course. The right foot, [illegible] example, was on the left of the other, but in tracing the limb [illegible]ward the finger was carried to the right side of the central axis, [illegible] to the left, and finally to the right hip. The left limb was similarly contorted. Where the legs crossed each other, and bore quite hard upon one another, there were excoriations and ulcers.

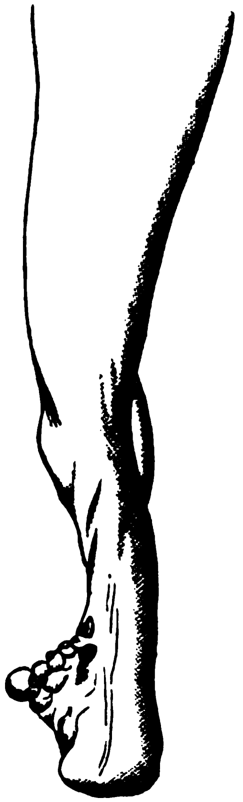
In commencing the operative procedure, I first divided, subcutaneously, with a tenotome, such tendons as seemed most prominent through contraction. After dividing ten or twelve tendons I was enabled to untwist the limbs, and the better to see what muscles were still causes of distortion; and twenty-five tendons and muscles were divided before the limbs could be placed side by side in their normal relations, and held there by an apparatus reaching from the feet to a hoop which surrounded the hips. The wounds healed well, and the apparatus kept the limbs apart and parallel, yet the nervous defect was so radical that the patient never became a good walker; he always hobbled about with a crutch and cane. However, the improvement was as great as may be expected in a case of the kind; it took a human being off his belly in the dust, and placed him on his feet.

FIG. 226.



In a variety of distortion where the legs do not entwine, but are loose at the knee and ankle joints, it may not be necessary to divide tendons, but simply to place the limbs in an apparatus consisting of a firm girdle around the hips, and side-irons having joints at hip, knee, and ankle, with firm connections at their lower ends with a metal plate in the soles of the shoes. If it be found in the course of treatment that the severance of a rigid tendon might be of use in relieving pressure or tension, tenotomy might be performed at any time. In most instances something desirable may be gained by the division of a few tendons. It is found by experience that the nearer normal the limbs are placed, whether by mechanical or operative surgery, or by both combined, the more regular in its action does the nervous power distributed to the legs become. Then, in addition, if the digestive functions be kept in an active and wholesome state, the entire bodily powers, which are commonly in a debilitated state among those who have enfeebled extremities, become invigorated. Young persons who exhibit a weakened condition of the muscles and a laxity of ligamentous tissue, are apt to have protuberant abdomens, poor appetites, and bad breaths. They need sulphur, santonine, bitter tonics, and iron. As they grow older they improve in strength, especially if their digestive and assimilative powers be kept in a vigorous state.

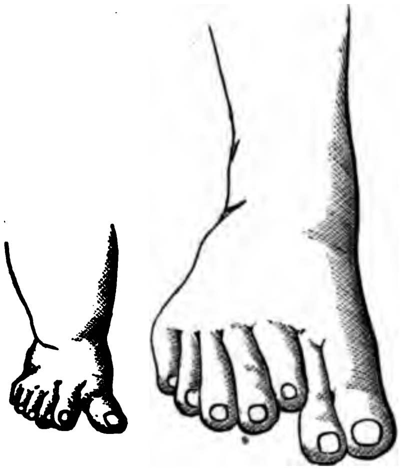
FIG. 227.



A leg is occasionally distorted by the inodular tissue which succeeds a burn. I have observed a foot so drawn by cicatrices that the tarsal bones were dislocated. In a case as much distorted as that represented in the accompanying diagram, there is no hope of cure, either by the application of orthopedic apparatus, or by the use of the knife. Indeed, if the deformity is of long standing, there can be no rational expectation of any great degree of restoration. Enough can be done in some instances to relieve chronic ulceration and vascular disturbance in the limb. Sometimes the cicatricial tissue can be dissected away, and the traumatic chasm filled with a flap of elastic integument transplanted from sound skin in the immediate vicinity. Cases of this kind differ so much, one from another, that no special rules can be laid down for their management, but the surgeon having a case in charge must be governed by the general principles applicable in other branches of surgery.

The foot is more likely to vary in the number of digits than the hand. If the fibula be wanting there will be but three toes; and absence of the tibia reduces the digits to two, and they will be large and distorted. It is not uncommon to have a supernumerary hallux which diverges from the true axis of the foot as does the first toe of quadrumana. When seven toes exist there is usually a supernumerary fibula, or a slender bone on the inside of the tibia. However, cases do occur in which there is a redundancy of the toes without a variation in the bones of the tarsus or leg. It is difficult to bring forward a rational cause for redundancy, while it is seemingly easy to speculate upon defect in development. The pentadactyl type prevails among mammals and reptiles; and variations are confined to deficiency, and never reach redundancy, except as an abnormity. Seven toes, then, must be regarded as wholly a *saltus* in organization, and not as representative of anything established as a type in nature.

FIG. 228.



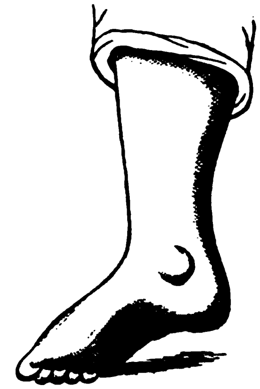
The treatment of supernumerary toes consists in amputating such as will allow the foot to resume its accustomed size and shape. In most instances this can be done as easily as a diseased toe can be excised. If the redundancy extend to the metatarsal bones, the removal should reach the tarsus. It is not judicious to disturb the tarsal bones or a supernumerary leg-bone. A redundant hallux, with its extra metatarsal bone, may be excised with comparative safety, though the digit is apt to be quite large.

CLUB-FOOT.

Among the various deformities to which the human form is liable there is none more interesting and important than *talipes*, or club-foot. Besides being a source of great physical inconvenience, the defect is obvious to every eye, and often the subject of idle remark and derision on the part of the unthinking and the heartless. Although the deformity has attracted the attention of surgeons in every age, its successful treatment was not attained until a comparatively recent period. Talipes has been divided into a variety of species by orthopedic writers, not a few of whom have seemed as ambitious to exhibit refinements in nomenclature as to promulgate rational views in regard to the cause and management of the deviation. A distorted foot directly depends upon a lack of balance in the muscular forces of the limb; the muscles derive their power from their nutrition and nervous endowment; and these conditions depend largely upon the functions of the spinal cord and assimilation, therefore the defect is not substantially local, but has its origin in the great vital centres of the body. Parasites in the intestinal canal may provoke a convulsion which will be succeeded by lack of muscular co-ordination in the legs. It is well known that a child having straight eyes may go into convulsions and come out with more or less strabismus. The same may be said in regard to the legs and feet, a convulsive paroxysm may destroy the harmony of muscular action in the extremities of the body, therefore the first step towards a cure is in removing the provoking cause of convulsive action.

The sciatic nerve divides into the internal and external popliteal nerves; and if these two branches be pursued to their terminal ramifications, it will be seen that the larger of the two, which becomes the posterior tibial, is distributed chiefly to the gastrocnemius, soleus, tibialis posticus, and the flexor longus and brevis digitorum muscles. Now, it is known that these muscles are preternaturally contracted, or are too powerful for their opponents, in what is called talipes *equinus* and *varus*, or that variety of deformity which is characterized by elevation of the heel, with a tendency to tramp upon the outside of the foot, the toes being strongly flexed, especially the great toe. The fascias and ligaments on the inside of the foot are apparently much too strong, the corresponding tissues upon the outside of the foot being undeveloped, feeble, and relaxed. On the contrary, if the ramifications of the external popliteal or peroneal nerve be traced, they will be found to supply those muscles which are too strong for their antagonists, and therefore establish talipes *valgus* or *talus*, the peronei and extensor longus and brevis digitorum muscles, and the liga-

FIG. 229.

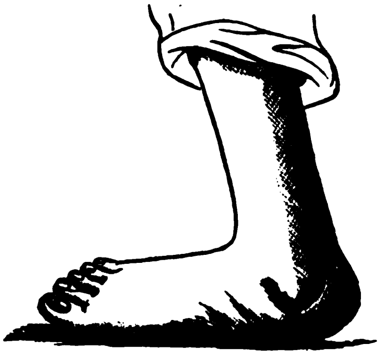


Talipes varus.

ments and aponeuroses on the outside of the foot, ankle, and leg, taking the greater part of this branch of the sciatic nerve.

The kind of club-foot embraced under the head of valgus and talus may be considered as constituting one variety of the disease, or deformity; and varus and equinus as another species; thus bringing all kinds within the range of two varieties. Talipes *varus* is much more common than *valgus*, the predominance arising from the fact that the muscles which flex the limbs are more powerful than those which extend them. When paralysis affects a limb, the attitude taken is usually that of flexion. Whenever the muscles on the outside of the foot and leg predominate over those upon the inside of the limb, the patient walks upon the inside of the foot and the inner malleolus, the ankle appearing weak, and the fascia in the hollow of the foot undeveloped and lax. The knee is thrown in while walking, and the toes are apt to be elevated. The foot appears unusually straight, the arch being lost, and the toes turned outward. Such a foot gives the patient an unsteady and awkward gait; the calf of the leg is small, the heel apparently long, and the instep low.

FIG. 230.



Talipes valgus.

Inasmuch as several muscles of the leg derive nerve filaments from both of the great branches mentioned as springing from the sciatic, mixed cases of talipes are met, though in almost all varieties a predominating tendency to one kind or the other may be observed. The allegation that a lack of amnionic fluids, pressure of the uterine walls upon the child's legs, the mother sitting too much cross-legged, and other absurd notions, as the causes of pedal distortion, is no longer worthy of attention. Those persons who have to use the muscles on one side of the limb on account of caries, ulcers, cicatrices, and other morbid states, may have what could reasonably be called acquired talipes. Individuals in the habit of wearing " run-over " shoes may at length suffer from a twisting of the limb that demands orthopedic treatment. A girl of my acquaintance who, while young and playing in bare feet, received a piece of glass in the outside of the heel, afterward so turned the foot to avoid a pricking sensation that she brought about a state of talipes valgus.

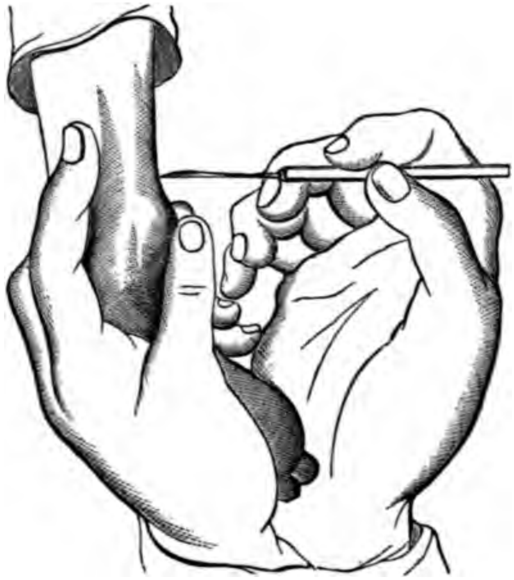
Both feet may be affected with talipes, but the relative frequency of the double variety to the single has not been determined. From the reports of several orthopedic institutions it would appear that there are from two to three cases of single club-foot to one of the double variety. One foot is commonly worse distorted than the other, the right suffering most. Boys are oftenest afflicted with talipes *varus*, and girls with *valgus;* and as the latter variety is much more rare than the former, males are oftenest the victims to the disease. When the defect is hereditary, both sexes seem to be equally liable to it.

Talipes may present any degree of deformity, ranging from a slight deviation to a coiling under of the toes, so that the patient really walks upon the dorsum of the foot, the bones of the tarsus having been dislocated by the distorting forces. In the worst cases, the foot, when enveloped in a boot, appears to those unacquainted with the deformity, to have taken a semi-rotation on the ankle as an axis, leaving the toes projecting backwards. After a foot begins to deviate, there is no certainty that it will cease twisting until it has reached the worst distortion the deformity is capable of attaining. As the patient increases in weight and strength, the foot is more and more crushed out of shape, unless something is done to overcome the vicious tendency.

Treatment.—A few years ago the notion prevailed that the division of a few tendons was enough to cure any case of talipes, and the employment of apparatus to assist in the restoration was ignored. Since that time manufacturers of orthopedic instruments, desiring to get rid of the operative surgeon, have declared that a properly made machine was sufficient to overcome any species of talipes. But, from considerable experience in the management of club-foot deformities, I am satisfied that the skill of the operative surgeon and of the surgical mechanician should be combined, if the best results are to be obtained. A slight deviation in the foot of a young subject may be cured by mechanical means alone, but a severe distortion of long standing can not be overcome unless one or more tendons be divided. An apparatus which is made to twist a badly distorted foot into proper position can not avoid pressing so severely upon certain spots, that bruising and sloughing will follow.

In cases of talipes equinus and varus, it is generally necessary to divide the tendo-Achillis alone, for a division of this tendon lets the heel down, and gives the foot an opportunity to be flexed on the leg. To test the need of this operative measure, the foot is to be pressed upwards, toward the anterior aspect of the leg. If the normal flexion can be obtained without making the heel-cord specially tense, there is no call for tenotomy; but if the tendo-Achillis be made tense before the normal degree of flexion is attained, the tendon should be subcutaneously divided.

FIG. 231.



Subcutaneous division of tendo-Achillis.

To perform tenotomy on the tendo-Achillis is one of the simplest operations in surgery. The patient does not require an anæsthetic, for the tenotome is as slender as a needle, and the structure divided has few nerves of sensation. The foot is to be grasped in the left hand, with the forefinger resting on the integument just opposite the point where the knife is to enter. The manner in

which the foot is to be held, and the
as it is to puncture the skin is faithfu
diagram. The knife enters flatwise a
the skin on the opposite side not bei
of the point of the tenotome can be
which rests against the integument.
tering, the tendon is made tense b
execution of this precaution makes
the knife can be entered without go
any portion of it. When the tenoto
depth, its edge is to be turned up ag
to divide that cord by a lever-like
required to make the knife do its wo
being tense, they easily give way, son

Those surgeons who would make
variation, have advised cutting the
urged some other trivial change, arg
quickened and more certain; but it
the reparative act is as speedy and s
of the tendon is by a transverse as b

The tendon having been divided
tenotome is to be turned flatwise, a
small puncture made for its entrance.
deeper than necessary, and made to
only a few drops of blood will run f
the thumb of the operator be presse
minutes. A small piece of isinglass
the puncture in the skin after the th
this time it is well to bring down the
forcibly, or by a bounce effected by
sole of the foot. While this is bein
contracted tissues will be heard, ar
It may be now discovered that oth
well as the tense bands of fascia wh
of the foot. The tibialis anticus te
quite rigid, refusing to let the foot
after the tendo-Achillis has been div
overcome by introducing the tenoton
the annular ligament, at a point whe
and cutting it carefully to avoid doi
and articular structures of the tarsus

by carrying the knife under the tendon and cutting upwards, or *vice versa.*

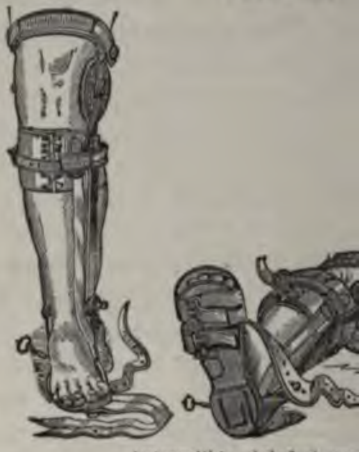
The tibialis posticus, though an active agent in adducting the foot, rarely needs section after the heel-cord is divided. Where the tendon passes in the groove of the internal malleolus, its section would not be difficult. Above this point the posterior tibial artery is proximate to the tendon; and below the ankle the tendon is rarely salient, being buried in tissues which obscure the operation of subcutaneous division. The safest point to divide the tibialis posticus is near its insertion. The tenotome having been slid along to the bone at the prominence of the scaphoid, until it be well under the tendon, the structures resting upon the edge of the knife are to be divided close to the integument; and then the tendon will be severed.

The plantar fascia, when too short and tense, as it often is, should be divided freely by introducing the tenotome at the inner edge of the foot, where the band is most prominent, and cutting outwards to the integument. The large plantar arteries are too deep to be in danger. This is the most painful part of the operation; and therefore to be performed while the patient is under the influence of an anæsthetic. As soon as the knife is withdrawn, which in all subcutaneous operations is to be executed without enlarging the puncture, the blood set free is to be pressed out with the finger, and the orifice sealed with a piece of adhesive plaster. The foot is now to be twisted into its natural position, where it may be pretty effectually secured for three or four days by the use of adhesive strips and a bandage. A strip three quarters of an inch wide and half a yard long, is to be applied by sticking one end to the ball of the great toe, and carrying it under the foot, then up across the external malleolus, and to the outside of the leg as far as it will reach. Other strips may he applied in a similar manner until the foot is quite firmly held in the position desired. To make this temporary dressing a little more complete, a bandage may be run upon the foot and leg, care being taken in its application to secure as much assistance from it as possible.

At the end of three or four days a club-foot shoe or apparatus should be applied to the limb, the bandage and adhesive strips having been previously removed. To adjust and regulate from time to time the machines to be employed in the treatment, require more patience and skill than have been demanded in the

operative part of the curative procedure.
with the knife are lamentably deficient
which is absolutely necessary in the s
talipes. No advantage arises from di
power is applied to force the divided
stances an inch of new material is requ
tendon; and in order that this chasm
structure, the force which separates the
tendon must be steadily maintained unt
is strong and well matured. Parents w
apparatus because it irritates the skin
instruction should be given, when the p
the surgeon's eye, that the machine be
it be removed for a few minutes while
upon irritated and excoriated spots.

FIG. 232.



Autenreith's club-foot app

The Scarpa shoe for the cure of ta
swinging sole, a heel-piece, two side iro
swing the sole, and a strap to elevate
ankle necessitates depression of the he
vated. A strap crosses the instep, an
through holes in the heel-piece of the i
snugly tied on the outside of the instr
the patient's heel where it belongs. M
apparatus are in common use; and some
provements upon the original shoe. Th

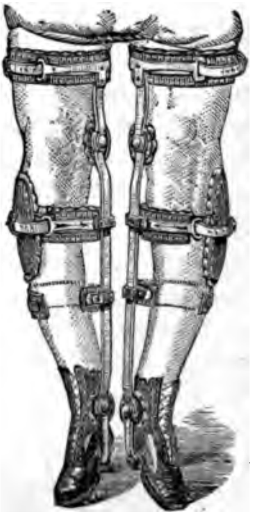
represent club-foot apparatus constructed by Mr. Autenreith, a reputable mechanician of this city. Instead of using a strap to elevate the toes he employs a rachet which is moved with a key. This apparatus is to be worn two or three months, and even longer in some instances, then a pair of firm shoes, with side irons attached, may be substituted for the first machine, and worn for a year or two, or as long as any mechanical assistance may be needed. I would add, that the hinges at the ankle-joint should be double and tempered very hard, or the wear will make way for too much lateral motion.

In talipes *valgus* the tendo-Achillis may possibly need division, yet generally it is long and lax. This variety of club-foot depends upon a laxity of tendons and tissues on the inside of the leg, ankle, and foot, and rigidity on the other side, therefore the peronei (longus and brevis) are too much contracted, and consequently need dividing. These tendons pass the external malleolus in a sheath which ought not to be opened. The best point to divide them is one a little below the annular ligament. The tenotome should be slid beneath them and be made to cut from within outwards, so as not to endanger articular structure. Other tendons that may need dividing are to be cut at their most salient points. Talipes valgus is less susceptible of improvement than varus, though both varieties are to be managed on the same general principles.

Not unfrequently the muscles about the hip are defective, rendering a case still more complicated and difficult to cure. I have several times been obliged to order the outside leg-iron to extend to the side of the ilium, and there join a hoop which is made to surround the pelvis, for the rotation was so great at the ileo-femoral articulation that I could not otherwise keep the limb steady.

It is not uncommon for the hip, knee, and ankle-joints to be loose, weak and yielding, so that the patient is unable to walk without some kind of support. In most of such instances the bones are too much curved, giving to the difficulty the name of bow-legs. This defect is to be remedied by the use of an apparatus such

FIG. 233.



Apparatus to cure bow-legs and weak joints.

as is shown in the accompanying dia
is rivited to a stirrup of iron which
the ankle. In some instances the
tially paralyzed, consequently the o
referred to the spinal cord. The
and legs would warrant the assump
ferior extremities was especially fau

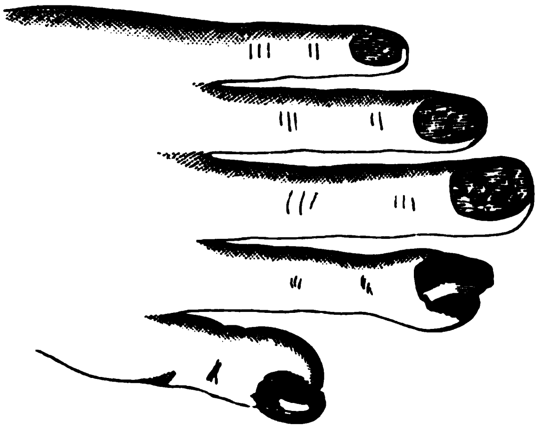
It is rare that any of the muscles
order to establish a proper balance
limbs, yet if there be a preponderan
or set of muscles, which can be co
no good reason why an operatio
Much can be done advantageously b
the patient; and by rubbing the f
ointments.

DISEASES OF T

An ulcerative state at the root of
rather common in a mild form; b
denominated *onychia maligna*—whi
milder form of the disease is usual
finger, and consists in a festered or
or at the root of the horny appenda
is a specific disease which flourishes
to the skin, and which is attended w
nary onychia can be accounted fo
morbid germ. If the end of a
squeezed, or bruised, the saw-like e
detached from its usual connection
and then the serrated edge jags the
inflammation which goes on to sup
action once started in the buried
nant or destructive state of inflam
ger swells, throbs, and becomes int
deep or maroon red over the root
root of the nail gets free and turn
beneath, and giving off a peculiarl
the finger becomes clubbed or bulb
the prolonged morbid state incites
tation, or almost any thing to get r
tress.

The best treatment, in most instances, is to wind the end of the finger with a narrow strip of adhesive plaster, the envelop reaching beyond the terminal articulation. This dressing prevents motion at the root of the nail, and protects the delicate and sensitive parts from all kinds of injury or violence. Under such treatment the old nail will become re-attached, or a new one will start beneath the other, and soon cover in the ulcerative surfaces. There is no objection to cauterizing the ulcer with a strong solution of carbolic acid, before the adhesive dressing is put on. The finger should not be re-dressed oftener than cleanliness demands. If the first dressing can stay in place a week, the course of cure will be somewhat advanced. When the disease is a manifestation of eczema or psoriasis, a lotion of Fowler's solution and glycerine, a drachm of the former to an ounce of the latter, is useful in subduing it.

FIG. 234.



Syphilitic nails.

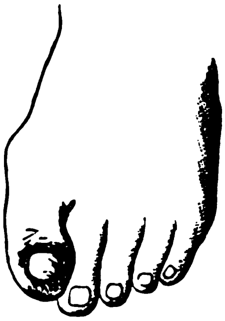
Syphilitic nails are characterized by inflammation of the integument that is already in an eruptive state. The nails being merely appendages of the skin, might be expected to partake of such diseases as affected the original or primary tissue. Syphilitic onychia renders the nails as rough as the outer surface of an oyster shell. In time, however, the new growing nail pushes forward smoother and smoother layers until the outer laminæ are normal. When the disease first appears at the roots of the nails a thin spatula of wood should be employed to carry a strong solution of carbolic acid into the crevice between the skin and nail. This application is to be repeated every two or three days for two or three weeks, then the diseased parts may be daily touched with citrine ointment. The appearance of the roughened nails may be improved by smoothing them with fragments of glass or fine sand-paper; and the patient should wear gloves during the course of the disease, especially if the weather be cold and windy.

IN-GROWN TOE-NAILS.

The worst defect which happens to the toe-nails is an *in-growing* of the nail of the great toe. This seemingly insignificant yet distressing affection is caused chiefly by crowding the toes with narrow shoes. However, the shape of the nail and the contour of the toe, have something to do with the difficulty; for it is not unfrequently found that the great toe on one foot is never troublesome, while the other is a constant source of annoyance. In the worst cases the flesh is made to rise above the side of the nail, and the adjacent toe serves to press them into irritative contact. The side of the nail being sharp and rough soon establishes an ulcerative state which is very painful. Often the patient is compelled to lie up, and wear a wide slipper until the inflammatory action subsides. Then, upon resuming the narrow shoe or boot, the irritation is provoked again.

Mild forms of the complaint may be mitigated and even cured with simple means, such as paring the nail so an acute angle shall be established in front and by the side towards the adjacent toe. In addition a small pledget of lint may be kept crowded under the corner of the nail; and the dorsum of the nail may be scraped until it is thin and yielding. Such management will cure ordinary cases, but for the worst forms of the disease there is no radical relief except in avulsion of the whole or a part of the nail. But if the nail be simply removed, and nothing be done to prevent a renewal of the structure, it will not be long before the new nail may prove as annoying as the original appendage; therefore a caustic should be applied to the traumatic surface which is pow-

FIG. 235.



In-growing nail.

erful enough to destroy the nail-producing cells. An escharotic of moderate power will do no good as a preventive.

The operative procedure may be conducted as follows: After the patient has been anæsthetized, a scissors blade is to be thrust flatwise under the nail to near its root, then the implement is to be turned up so the nail may be divided from its free end to the other by closing the scissor blades. A pair of strong and toothed forceps are next employed to seize the ingrowing half, and to wrench it from its place. If the other half has not been a source of annoyance, it may be left where it has been. Generally I remove both halves; then cauterize the traumatic surfaces with chloride of zinc, using the end of a spatula to carry the caustic deep into the sulcus recently occupied by the nail. The wound may then be dressed every day with Mayer's ointment until the raw surface is all covered in with cicatricial tissue. If nodes of horny material form along the middle region once occupied by nail, they serve to shield the delicate parts, and to form an insensible support for the shoe to rest on.

It seems rather barbarous to twist or wrench a nail from its position to get rid of an ingrowing disposition upon one side of the appendage, yet experience has taught the lesson that a radical cure, brought about by the manner indicated above, is not dear, though quite severe. Palliative means will do in some cases, while in others they are unsatisfactory. If the nail be uprooted and dislodged, the wound will heal in two or three weeks; and the patient is not confined to the house for more than a week. I have known patients to resume their usual avocations the next day after the avulsion was executed. In the event that fungous granulations appear upon the healing surface an astringent agent may be applied to them.

SECTION XX.

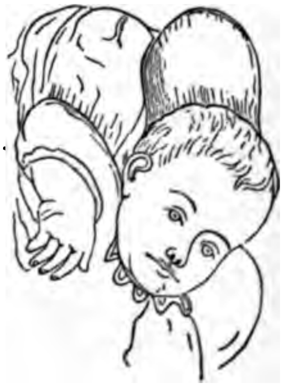
DISEASES OF THE CEREBRO-SPINAL MENINGES.

Hydrocephalus is the result of undue secretion on the part of the arachnoid envelop of the brain. Serum accumulates faster than it is absorbed, and as a consequence the gathering fluid presses the sutures of the cranium apart, and presents an enormously developed head. The cause of the super-secretion is usually scrofula or hereditary syphilis; and the victims are commonly children from one to three years of age. A child with considerable accumulation of serum between the brain and the cranial parieties, exhibits bulging eyes, a pale countenance, a pinched and flabby body, attenuated limbs, and a head of monstrous size, which is moved and poised with the greatest care and deliberation. It will not turn its head quickly, nor stoop to pick up anything. Such movements create undulations in the cephalic fluids that are not pleasant.

There is nothing very encouraging in the treatment of hydrocephalus, yet many cases terminate in complete recoveries. Drawing off the serum with an aspirating instrument is legitimate, yet the evacuation does very little good unless the medication be efficient enough to arrest the excessive secretion. Donovan's solution, in drop doses, repeated every three or four hours, will make a decided impression for the better in many instances. The use of sulphur, iron, and the phosphates, may contribute something towards a cure.

Encephalocele is a hernial protrusion of the membranes of the brain, and is analogous to meningocele in spina bifida. It is commonly associated with some deficiency in the cranial bones, generally the occipital. The parietal and frontal may be defective, and thus bring the protrusion on top of the head or in the forehead. Appearing where it may the tumor is made up of serum and the investing membranes—the meninges of the brain, the peri-cranium, the occipito-frontalis aponeurosis, and the scalp. Dr. Lichtenberg reports having met with a case that projected into the child's mouth, the opening in the skull being in front of the sella turcica. Encephalocele may disappear under the influence of gentle pressure exerted with collodion or an elastic cover, yet no great degree of reliance can be placed upon any kind of treatment. In an occasional instance some part of the encephalic mass protrudes and forms a part of the contents of the tumor. In such an event nothing remedial could be expected from any plan of treatment, but if no brain was present in the tumor, an elastic ligature might be safely used around the base of the lump, until a smaller pedicle existed, and then this could be divided without danger, and with the reasonable expectation that the result would be satisfactory. A fragment of skull may be removed without danger of encephalocele, therefore such a tumor can be excised without risk from hernia of the brain through the aperture in the skull.

FIG. 236.



Cephalocele.

Meningocele is not essentially different from encephalocele, except that the osteal defect is in the posterior aspect of the vertebral chain instead of being in the cranium. The axis, or second cervical vertebra, may be left open posteriorly so that a tumor the size of a hickory nut may show itself. Such a lump would not be regarded by the unsuspecting as a matter of much importance, and might therefore be punctured; but a sudden death would remind the operator that he had executed a rash act. Such a tumor might result fatally if left to itself, yet the parents would regard such an issue as Providential, and that their medical adviser was in no respect responsible for the disease or its result.

A meningocele in the cervical region may disappear of itself, or remain for years without interfering with the bodily functions. If the protrusion get as large as a child's head, and more or less paralysis attend the developement, a part of the fluid contents of the sac may be removed with an aspirating needle, and then a few drops of the tincture of iodine may be injected into the tumor. Such an operation is attended with some risk from shock, meningitis, etc., yet the danger is imminent if no kind of treatment be adopted. Pressure may first be tried, but it rarely is attended with any beneficial result. The chasm in the bones will not fill as long as the gap is pressed open by the protruding membranes of the spinal cord; and the hernial mass is not disposed to diminish in size, but to grow larger. It is a hazardous enterprise to open such tumors, as the spinal fluids are quickly drained away, yet when they have been excised by the unthinking and inexperienced, the result has not always been fatal. Dr. Scudder informs me that he once was called to a child which was delivered by a midwife, and found that a meningocele had burst during delivery. He cut away the superfluous integument, closed the wound, and supported the tissues with a belt and compress. The child survived, and grew to adolescence without paralysis or any serious defect to its mental or bodily powers.

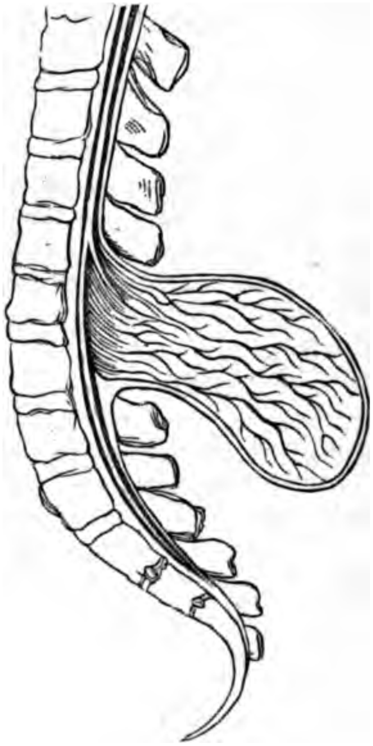
Spina bifida is occasionally met in new-born children. The defect arises from lack of development in the posterior segment of the parieties of the spinal canal. The spinous processes and laminæ are wanting, and sometimes the transverse processes of two or three vertebræ. The deficiency may occur in any part of the vertebral chain, but is oftenest met in the lumbar and sacral regions. Where the chasm in the bones exists, a protrusion of the coverings of the spinal cord takes place. The tumor may contain subarachnoid fluid alone, or serum and nerve-trunks from the spinal cord. The tumor may vary in size, from the smallest lump that can be felt to one as large as a child's head, and even larger. The integument, which constitutes the outer layer of the walls of the tumor, is pearly white, tense, and almost translucent. The bulging mass imparts to the fingers a feeling of fluctuation as if a sac of pus, serum, or other fluid were felt. The child does not suffer from having the tumor manipulated, and in every respect appears as lively and thrifty as other infants. The mother who may never have seen such a case, or even heard of such a thing, can not realize the gravity of the defect.

In rare cases, a deficiency in the vertebral walls exists in two places, constituting a double aspect of the disease. The tumors may be near together, or one in the cervical region and the other near the coccyx. Separate tumors, small in size, would be less dangerous than a single development of extensive proportions.

When talipes, incontinence of the urine and fæces, and other functional disturbances exist in common with hernia of the meninges of the spinal canal, there is reason to suppose that the cord itself protrudes, and that no kind of treatment will result in a cure. If hydrocephalus exists in a victim of spina bifida, the dorsal tumor can be distended by pressing on the head, and *vice versa;* and fluctuation imparted to one swelling is communicated to the other. When a child having spina bifida cries, the tumor becomes tense.

Victims of spina bifida may continue robust for a year or two, though most of them are born feeble, and die in a few weeks or months. The immediate cause of death may be convulsions, or bursting of the meningeal sac, and thereby draining the cerebro-spinal canal of the fluid essential to vital operations. The walls of the tumor being thin and tense, it is reasonable to expect that ordinary friction might establish ulceration, or that undue pressure would burst a sac of such tenuity. A slight puncture has evacuated the tumor gradually, so that a cure has followed. A small opening in the sac has existed at birth, through which the superabundance of spinal fluid has leaked slowly away, and a spontaneous cure has been the result. Such a termination is not to be expected, yet it comes within the range of possibilities.

FIG. 237.



Spina bifida and protruding tumor in the lumbar region.

Treatment.—From what has been said concerning the nature of spina bifida, it may be inferred that the prospect of a cure by medical or mechanical appliances, or by operative measures, is not flattering. If the fluid be drawn off suddenly, convulsions or fatal collapse may be expected. If tapping be practiced, it is well to use an aspirator, and not draw off much fluid at a time. If the puncture made by the needle allows the contents of the tumor to gradually leak away, no harm need be expected from the gradual waste. The tumor should be kept protected with cotton batting, or other soft covering, in order to avoid friction that is liable to terminate in ulcerative action.

At one time it was announced by a surgeon high in authority that injecting a meningeal tumor with tincture of iodine would result in a cure, as if the sac were like that of a hydrocele, but it is now known that the practice is unsatisfactory and even dangerous. If the tumor have a narrow pedicle, a cure may be obtained by exciting inflammation in the sac; and there is, perhaps, no safer process than to throw a few drops of the tincture of iodine into the protruding membranes. If a tumor be pedunculated enough to allow a ligature to be thrown around the constricted part, an elastic cord may be used until it may seem safe to excise the mass. I successfully performed such an operation in a single instance.

Of late I have recommended what has been called a "tan-bark poultice," although the application is not a mushy mass. A quantity of pulverized oak or hemlock bark, such as is employed in tanneries, is to be sewed in a bag of thin muslin, and applied to the tumor. Enough moisture gets to the powder to extract some of the astringent qualities. The integument grows tough under this tanning process; and the astringency of the bark diminishes the size of the tumor. A case now under this treatment has been greatly benefited, and a complete cure seems practicable.

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